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UNIVERSITY STUDIES

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The First Revolutionary Step (June 17, 1789)

BY CARL CHRISTOPHELSMEIER

I

The success or failure of the reforms anticipated from the meeting of the states general depended primarily upon the solution of two fundamental questions, namely, representation and organization. The sum total of opinions as to their settlement was as broad and as deep in content as was the volume of the revolutionary spirit itself, and the extremes of opinion differed widely. A large majority of the nobles, including the superior clergy, demanded that each order should be given what seemed to them the constitutional one-third representation, while the demands of the *tiers-état* ranged from representation proportionate to the relative population of the three estates—which would have entitled the *tiers-état* to at least ninety-six out of every hundred deputies—to a representation equal to one-half of all the delegates to the states general. The king in his council (December 27, 1788) decided that the third estate should be given a representation equal in number to the combined representation of the clergy and of the nobility. This decision, although most unsatisfactory to large circles of individuals of each of the three orders, was, nevertheless, accepted with a sufficient measure of grace. The solution was truly a great victory for the *tiers-état* provided the states general should constitute itself as a single assembly.

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Thus, although the question of representation was settled, another question of equal magnitude remained to be solved, namely, how the states general should organize itself. The work of the national assembly depended wholly upon its solution, for if the deputies of the three orders should meet in three separate halls the privileged classes could allow just such reforms as they wished; but if, on the other hand, all the deputies should meet in one assembly and vote by head, the *tiers-état* could control the action of the assembly. The question of organization was thus a vital one, for the fate of the states general and of the constitution and, therefore, the fate of France depended upon its treatment.

It was, according to Rabaut de Saint-Etienne, on the evening of May 5, the very day of the opening session, that "the deputies of the commons, having assembled by provinces, agreed that they would hold their sessions in the hall of the states general, that they would consider this hall as the national hall, that they would there await the other orders for the purpose of deliberating in common, and that they would not swerve from this line of conduct."[1] They did, in fact, adhere to this policy until the deputies of the other two orders joined them.

The states general was formally opened on May 5 at Versailles in the *Salle des Menus Plaisirs*. We are concerned with this stately and truly royal session only in so far as it touched the solution of the question of vote by head or by order. The king did not speak of the matter of organization at all. His anxiety in regard to it is seen, however, in his appeal to the deputies to work in harmony. Barentin, the keeper of the seals, announced that the deputies were to meet the next day and verify their credentials as promptly as possible, while Necker, in a brief reference to the subject, seemed to favor three assemblies. The great problem was left for solution, therefore, to the deputies of the three orders themselves. The hope or fear on their part that the king might decide this all-important question, or at least compromise it by showing his preference either in favor of the *tiers-état* or of the privileged aristocracy, was dispelled.

[1] Rabaut de Saint-Etienne, *Précis*, 117.

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When the deputies of the *tiers-état* assembled on the morning of May 6, they learned that the deputies of the clergy and of the nobles were meeting in separate halls and were even preparing for the verification of their credentials and for organization as separate orders. The assembly was in great confusion and disorder, for it did not know how to begin its deliberations. And this most embarrassing situation was made all the more difficult by the fact that some deputies, who managed to make themselves heard, wanted the assembly to remain idle and take no step toward organization. They wished the deputies of the *tiers-état* to act, not as an assembly at all, but as individuals, a group of men, "a club of friends," who were waiting for the absent deputies in order to form themselves into an active assembly. But some other deputies demanded the immediate organization of the deputies of the *tiers-état* as a national assembly; while others, more conservative, urged that before resorting to such an extreme expedient all amicable and conciliatory means should first be exhausted.

In these debates of the first day, we notice all the elements of the policy which the *tiers-état* followed up to June 17 when it constituted itself the national assembly. When the deputies had separated after this first day's session, Gaultier de Biauzat wrote to his constituents: "If my opinion becomes general, we shall notify the clergy and the nobility tomorrow that the *tiers-état* is complete, and urge them to present themselves in the hall of the commons."[1] He thought that any further action on the part of the *tiers-état* would depend upon the response which the clergy and the nobles should make to the invitation; that a final invitation would be sent, however, in case the orders should persist in separation, and that subsequently those deputies who should be present in the general hall should proceed as the states general of the nation. The same and similar views are repeatedly expressed by the deputies previous to June 10, when this policy of a last invitation and of the organization of the assembly of the commons began to be actually carried out. But up to that time

[1] Gaultier de Biauzat, II, 31–37.

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the deputies of the *tiers-état* succeeded remarkably well in their policy of inactivity.

While the commons avoided every appearance of organization, they did, for temporary convenience, namely for the purpose of intelligent deliberation, allow the senior deputy to act as presiding officer and several other members, those just beneath him in age, to assist him in his functions. This policy of inactivity was the very best course for the assembly to follow, for the deputies of the *tiers-état* were not yet ready to take the decisive step of constituting themselves which they later took. It was essential for the members to move slowly until an *ésprit de corps* had been developed. The deputies became in time better acquainted with each other and with each other's wishes and demands. They learned the demands and weaknesses of the other orders and the aimlessness of the government, and they were encouraged and emboldened by the feeling of the solidarity of their own interests and by the moral support which they constantly received both within and without the assembly.[1] The public associated itself with the discussions of the deputies assembled in the general hall which was usually filled to overflowing with spectators. The applause or hisses of over two thousand men and women helped, at times, to excite the assembly to fever heat. Reports of the deliberations were sent to Paris and to the provinces. Everywhere men gathered in groups to discuss the problems before the states general. The strength of the third estate grew daily, while that of the privileged orders decreased as steadily.

After a first unsuccessful attempt on the part of some of the deputies of the *tiers-état* to constitute their body as an active assembly, another, more earnest and much more systematic effort to organize was made on May 14. Learning that the deputies of the *tiers-état* were opposing verification of credentials by orders and waiting for the deputies of the clergy and of the nobles to join them and verify the credentials in common, the clergy had suspended verification of their credentials on May 7. Moved by

[1] Gaultier de Biauzat, II, 32, 52. *La révolution française*, XXIII, 357, 362, 471.

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an invitation received on that day from the commons, they began to consider plans that might conciliate the three orders, or at least enable the clergy to withdraw from the struggle between the orders and thus assume a neutral attitude.[1] As the deputies of the privileged orders refused to assemble in one chamber in order to consider the question of organization, the only way in which the matter could be discussed was through conferences of commissioners appointed by each of the three orders. The clergy, after debate, decided to elect such commissioners and invited the nobles and the *tiers-état* to do the same. This action was extremely wise on the part of the clergy, especially on the part of the higher clergy, who, while remaining neutral, could thus control a majority which sympathized with the interests of the third estate. And was it not in keeping with the self-chosen mission of the church to preach peace and harmony? In the meantime, the clergy could remain inactive and need not take either side. It did not compromise its position towards either order; it put itself in a most favorable light with the outside world; and, in the end, it could join the winning side without any loss of prestige which might result from the controversy. When the nobles resumed their session on May 11 the deputation of the clergy presented its plan. After careful consideration they decided, on May 12, to comply and elect commissioners. The following day they sent a deputation to the other two orders to announce their decision. The Duc de Praslin as spokesman said to the commons that he would read the resolutions passed by the *order of the nobility* which would show them its desire to maintain the fraternal union. A resolution of May 6 stated that the president and the twelve senior members were appointed as a committee on credentials, another of May 11 that those deputies whose credentials were verified without being contested were constituted as "the chamber of the nobility," and a third of May 12 that it accepted the proposition of the clergy and would name commissioners to meet the com-

[1] *Récit*, 15–17, 18–19; *Etats-généraux*, 19–21; Biauzat, II, 59–60; *Courrier de Provence, Lettre* I.

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missioners of the other two orders.[1] This information caused a fiery discussion among the commons which ended only on May 18. Immediately after the deputation had left the hall, attention was called to the gross inconsistencies on the part of the nobles; it was asked of what earthly use it was to adopt the plan of appointing conciliatory commissioners when the nobles had already definitely constituted themselves as a separate and independent order. And how revolting were the words of the Duc de Praslin when he spoke of the desire of the nobles for fraternal union, when they had shown, by their very action of constituting themselves, just the opposite desire. The debate was interrupted by the arrival of a deputation of the clergy, which again presented the plan of May 7, giving as an explanation for this repetition that on the former day the *tiers-état* had requested the proposition in writing.[2] On May 7 the commons had neither accepted nor rejected the proposition of the clergy. But since the nobility had now accepted it, the situation had changed. It was at this time most essential for the deputies of the *tiers-état* to maintain the full confidence of their constituents and also not openly to offend or defy the privileged classes, including the king and the court. They could not afford to appear arbitrary and irreconcilable in the eyes of the people. When the question whether commissioners should be elected or not came up in the commons on May 14, Rabaut de Saint-Etienne proposed that sixteen deputies be selected to meet with the commissioners of the clergy and of the nobility to hear their propositions; that the commissioners should occupy themselves, however, only with plans favorable to the union of all the deputies of the states general. "The commissioners elected must never abandon the principle of vote by head and of the indivisibility of the states general."[3]

[1] *Récit,* 15–17; *Etats-généraux,* 20, 28–29, 30–31; Duquesnoy, I, 14; Biauzat, II, 36, 59–60; *Courrier de Provence, Lettre* III, 2–4.

[2] *Récit,* 17–19; *Courrier de Provence, Lettre* III, 2, 4–5; Biauzat, II, 56; Duquesnoy, I, 17–19. The lofty and haughty manner in which the Duc de Praslin read the decrees of his order offended the commons even more than the decrees themselves.

[3] The *Etats-généraux,* 31–33, and the *Journal des états-généraux,* I, 23–27,

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The motion was conservative. Le Chapelier immediately proposed more radical action.[1] He said that the nobles had shown that they would not join the commons, and a compromise between vote by person and vote by order was impossible. He proposed, therefore, that "the deputies of the commons of France declare that they recognize for legal representatives only those whose credentials shall have been examined by commissioners named in the general assembly by all those who have been called to compose it, because it pertains to the 'corps de la nation' as well as to the 'corps privilégiés' to know and to decide upon the validity of the credentials of the deputies who present themselves; every deputy is a member of the general assembly and can therefore receive from it alone the sanction which constitutes him a member of the states general. And since public opinion is the first and chief care of the national assembly, and since it can only be established by common deliberation, the deputies of the commons can not allow that, by some special resolution of chambers which remain isolated, the principle is assailed that each deputy is, after the opening of the states general, no longer the deputy of an order, but that all deputies alike are the representatives of

put the motions and speeches of Rabaut de Saint-Etienne and of Le Chapelier on May 13 by mistake. The commons did on May 13 begin to discuss the mission of the nobles and got quite wrought up about it; the deputation of the clergy ended the debate on that day, however, for, immediately after it had left, the session was adjourned to nine o'clock the following day. Perhaps the commons felt that this postponement of the discussion was advantageous. All the other sources set the time for the motions on May 14. Both Duquesnoy (I, 17–19) and Biauzat (II, 50–57), writing the evening of May 13, fail to mention the motions when they speak of the deputation of the clergy and of the nobility. And both, writing again on May 15 (I, 19–22 and II, 57–63), speak of them as having been made the day before. *Récit,* 19; *Revue de la révolution,* XI, *Documents inédits,* 12–14.

[1]Our sources of information for the debate on May 14th are, *Récit,* 19–22; Duquesnoy, I, 19–23; Biauzat, II, 57–59; *La révolution française,* XXIII, 365–67; *Revue de la révolution,* XI, *Documents inédits,* 12–16; *Courrier de Provence, Lettre* III, 6–7, IV, 1–4; *Etats-généraux,* 31–33. It is explained in the preceding note that the *Etats-généraux,* 31–33, and the *Journal des états-généraux,* I, 23–27, by mistake, put the two motions of Rabaut de Saint-Etienne and Le Chapelier on May 13. Malouet made his motion on May 15, however, so both of these works make the same mistake again. See Biauzat, II, 58; *Courrier de Provence, Lettre,* IV, 4–7. Duquesnoy, I, 23, puts Malouet's motion on May 16 even.

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the nation—a principle which should be accepted with enthusiasm even by the clergy and by the nobles themselves and which ought to influence them in the determination to unite themselves with the commons in the general hall, where they have been awaited for the last ten days, and of forming themselves into the states general in order to verify the credentials of all the representatives of the nation. The deputies of the commons invite those of the clergy and the nobles who have received special instructions to deliberate in common, and those who, free to follow this patriotic impulse, have already manifested their willingness to do the same, to give an example to their colleagues by coming and taking the place destined for them.

"It is in this general assembly, it is in this union of all the sentiments, of all the wishes and of all the votes, that will be determined, upon the principles of reason and of equity, the rights of all the citizens. . . . Those who will still delay the accomplishment of such important duties—labors that will assure public happiness and the splendor of the state—are responsible for their actions to the nation.

"The deputies of the commons vote that the present deliberation shall be sent to the deputies of the clergy and of the nobles, in order to call their attention to the obligations which the role of national representatives places upon them."

Le Chapelier had prepared his motion with great care. It contained the essential points of the fundamental question of vote by person or by order which had been discussed for months. It was practically the same as that presented to the assembly by Sieyès on June 10. Between May 14 and June 10 more and more deputies were prepared to carry it into immediate execution, so that by the latter date the *tiers-état* could, because of the unanimity of its members, take the action outlined in this motion with a high degree of success. But even on May 14 Le Chapelier did not speak for himself only; he was the appointed spokesman of other deputies. The nucleus of the supporters of Le Chapelier's motion was the Breton deputation, of which he was the most prominent member.

Previous to the deputations of the nobles and of the clergy on

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May 13 the Breton deputies strongly favored the policy of inaction, waiting for the deputies of the other orders. Delaville Le Roulx writes to his constituents of Lorient on May 8 that he tried to convince Malouet on the evening of May 6 that the plan of sending a deputation to the other orders inviting them to join the deputies of the *tiers-état* was unwise. Legendre writes on May 13, most probably before the deputations of the nobles and of the clergy, that the commons hesitated "still to constitute themselves as representatives of the nation."[1] And Boullé writes on May 15 that the commons had persisted in their policy of inaction, waiting patiently for the appearance of the deputies of the clergy and nobility; that the deputation of the nobles on May 13 had changed the situation, however. "It was a little late when this deputation was received; we adjourned therefore at two o'clock as usual without taking any action in regard to it. But yesterday morning [May 14] it was said that the intentions of the nobles were now known; that the proper moment for action had therefore arrived." He then gives a good analysis of the two motions and of the debate that followed. He does not mention the fact, however, that Le Chapelier had been appointed, nor that his motion was supported by the Breton deputies, which he does in his succeeding letter written on May 22.[2]

Since the deputations of the nobles and of the clergy on May 13, the commons, wherever they met, discussed the plans they should adopt in regard to the other orders. The more they talked about the action of the nobles the more offended and excited they became. During the last week their hopes in the eventual union of the orders had steadily increased. They learned that they would all stand together in case of danger; but a peaceful adjustment was expected, for more and more deputies of the clergy,

[1] *La révolution française*, XXXIX, 521–22.

[2] *Revue de la révolution*, XI, *Documents inédits*, 11–20. "Cette seconde motion venait de la Bretagne; elle avoit été convenue entre nous, et M. Chapelier chargé de la presenter l'avoit fait avec applaudissement," p. 16.
Kerviler, René: *Etude biographique sur Baudouin de Maisonblanche*, 16. " . . . L'autre, de M. Le Chapelier, combinée la veille dans une assemblée particulière des Bretons." *University Studies*, published by the University of Nebraska, II, no. IV, 247, study by Dr. Charles Kuhlmann.

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among them some of the superior prelates, and of the nobles, among them men of the greatest influence, had expressed their willingness to join them at the first favorable opportunity. But this hope was now lost. Even some of the more moderate among the *tiers-état* interpreted the action of the nobles, not only as most insulting but as a veritable declaration of war; the gauntlet had been thrown into the arena; it was necessary to pick it up. It was said that a hundred nobles had declared that they would shed the last drop of their blood before they consent to vote by person.

It was for these reasons that many deputies of the commons who up to that time had favored delay decided on the afternoon and evening of May 13 that the proposition of the clergy should not pass the following day. More delay was considered not only useless but even dangerous; the nobility would never be persuaded to join the commons, and the people were becoming restless and demanded the organization of the states general; the commons would be compelled in the end to decide by their most resolute action the controversy in favor of vote by head anyway. They should decide it, therefore, at once, and then pursue an active policy.

The commons decided immediately after the two opposing motions were made that both should be considered together and that every deputy should be given the opportunity of expressing his opinions upon them before the roll should be called a second time for the vote. We must not infer, however, that those who clamored for a second speech were refused the floor.

The idea that the commons ought still to wait a short time before organizing themselves was developed by various deputies in their speeches.[1] Boissy d'Anglas counseled moderation and delay. "You have, gentlemen," he said, "to struggle in this moment against the natural arrogance of a courageous nobility, which believes that it must not take one step backward. In presenting yourself before it in such a direct manner, you exasperate it and arm it necessarily against you, while the voice of media-

[1] For the account of the sessions of May 15 and 16 see: *Récit*, 22–24; Biauzat, II, 57–59, 63–65; *Revue de la révolution*, XI, *Documents inédits*, 13–14; *La révolution française*, XXIII, 366; Duquesnoy, I, 19–25.

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tion may cause them to yield to persuasion. For these reasons, gentlemen, I favor the proposition of Rabaut de Saint-Etienne, but I do not reject the motion of Le Chapelier, which I only consider premature at the time. It seems well that we proceed step by step and advance slowly enough in order to be never forced to retreat."[1]

Another deputy favored Le Chapelier's motion,[2] but only after the conferences had proved unsuccessful. He said: "Gentlemen, the two motions presented yesterday appear to me equally judicious; but the first for the present, the second for the future; the one is an actual working plan, the other indicates to us what we may do in several days. The honorable members who have submitted these propositions to the discussions of the representatives of the nation merit at once our eulogy. . . . Without doubt, gentlemen, it is indeed necessary to act alone if the two privileged bodies, insensible to our patriotic invitations, wish to consider the questions, which are already decided, of the union of the orders and the vote by head." To the objection made that the conferences would bring about no conciliation, he answered: "Granted, but is it not a success to conquer our constituents, to convince them that we have deliberated before we have acted?" And to the argument of losing time, he replied that it was no objection at all. "Instead of to-day, we shall be fully as well situated in a week to give to Chapelier's motion every attention that it merits; in a week, I assure you, judging from the reception that it has received, we shall find ourselves here with the same principles, the same firmness, the same patriotism; in a week, reinforced by the deputation from the capital, we shall not expose ourselves to the reproaches of having taken a decision, so infinitely important, without the cooperation of a portion, as considerable as precious, of our colleagues."

During these days of debate, in the beginning of every session, Rabaut de Saint-Etienne's motion seemed to be favored, but

[1] *Journal des états-généraux*, I, 32–36.

[2] *Journal des états-généraux*, I, 36–43. This speech seems not to have been given in the assembly. Our source says, p. 36, that "le temps ne permet pas à l'un des députés de [le] lire publiquement à l'assemblée."

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when the members were stirred up by the discussion they became bolder and Le Chapelier's more resolute proposition gained support.[1] It was then that such revolutionary ideas as the following were expressed: "the *tiers-état* is the nation, the privileged classes are only small fractions thereof; my opinion is that we ought to go and declare it to them to-day, or tomorrow at the latest, and that we act upon this principle"; "a nation ought to exist without privileged classes"; "until today we have remained inactive, but it is the slumber of the lion, which when it is awakened rushes more ferociously upon its prey." Duquesnoy wrote that the motion of Rabaut de Saint-Etienne would probably carry, "but I doubt not that before the end of the month the *tiers* will determine to declare that it is the nation, that it alone is the nation."[2]

Practically all the deputies of the *tiers-état* agreed with Le Chapelier that they should constitute themselves as a national assembly with as many deputies of the clergy and of the nobles as would join them. They disagreed only as to the most suitable time for taking this action. This vacillation showed in itself that the third estate was not yet ready to take the decisive step. The leaders, such as Mirabeau, saw this, and, for this and other reasons already mentioned, they counseled delay. Mirabeau proposed a compromise between the two conflicting plans. He showed the merits and demerits of the two motions. But the motion of Rabaut, he considered weak, suppliant, and therefore humiliating to the commons. He suggested therefore that they invite the clergy, not the nobility, "because the nobility orders while the clergy negotiates." He said that the nobility could not be conciliated.[3]

[1] Biauzat, II, 64–65.

[2] Duquesnoy, I, 19–20, 22.

[3] *Courrier de Provence, Lettre* IV, 8–17. Mirabeau spoke on May 15, for on the evening of that day Duquesnoy (I, 22) writes: "Le comte de Mirabeau a voulu parler modérément, mais il n'a pu faire taire son caractère longtemps; il a percé bien vite. . . ." The *Récit*, 22–23, gives the import of it under the date of May 15. The secret agent to a minister speaks of it on May 17 in a letter written at Paris (*La révolution française*, XXIII, 366). He writes for the first time about the motions of Rabaut de Saint-Etienne, Le Chapelier, and Malouet and says that Mira-

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On May 16 Target appeared for the first time in the assembly and strongly favored the election of commissioners. He had been president of the electoral college of the *tiers-état* of Paris, was elected deputy of Paris (beyond the walls) and as such and because of his ability and popularity had a great deal of influence.[1] Rabaut de Saint-Etienne, accepting various suggestions made in the course of the long discussion, made two amendments to his motion. Commissioners to meet those chosen by the other orders should be elected, but with the understanding (1) "to limit the conferences of the commissioners to the question of verification of credentials in common" and (2) "to oblige these commissioners to render a written account of the conferences." Until the end of the session these amendments were principally discussed.[2] On Sunday, May 17, the deputies took a holiday. Just as soon as the first roll call was ended the next morning, the second call was started. The motion of electing commissioners with the two amendments was adopted by a very large majority. The commissioners elected were therefore not allowed to discuss the question of a single or separate chambers.[3]

The first two conferences of the conciliatory commissioners were held on May 23 and May 25. Long arguments ensued. The commissioners of the nobility attempted to prove historically that the credentials of the deputies to the states general had been verified in separate chambers, while the commissioners of the

beau, Volney, and Target discussed them. Mirabeau's journal itself states, (p. 8) after having reproduced Malouet's motion, which it says was made on May 15, that the debate was continued until May 18, but that it would give only one discourse which in a sense was a résumé of the whole discussion. The speech is without doubt that of Mirabeau; his speeches were, however, revised at times before they were printed.

[1] *Procès-verbal . . . des électeurs de Paris,* I, 4–54.

[2] Accounts of the session of May 16 are found in the *Récit,* 23–24; *Revue de la révolution,* XI, *Documents inédits,* 15–16; Duquesnoy, I, 23–25; Biauzat, II, 65; *La révolution française,* XXIII, 366.

[3] Biauzat, II, 68, says that seven voted for the first motion, thirty-three for the first motion with the first amendment, and three hundred and twenty for the first motion with the two amendments, and sixty-six for the second motion. *Revue de la révolution,* XI, *Documents inédits,* 16, Boullé says that sixty-six voted for the second motion and that the first with its two amendments had a plurality of three hundred and twenty votes. *Récit,* 24; *Etats-généraux,* 44.

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third estate, appealing to justice and reason, claimed that a national assembly was indivisible, that the credentials ought to be verified in common.[1] The discussion turned, therefore, altogether about the question of verification of credentials, for the commissioners had been instructed to confine themselves to it wholly. They were not permitted to touch the real question at issue—vote by head or by order. This command, together with the choice for commissioners of uncompromising deputies, shows that nothing good was expected from the conferences as far as the question under discussion was concerned.[2] The results of the conferences were foreseen. Duquesnoy wrote: "It is very evident that these conferences can produce no other effect than to cause greater irritation and antagonism." Again, "The nobility will never adopt the vote by head, the *tiers-état* never vote by order, and the nobility will refuse the common verification of credentials. The nation alone has the right to verify them; it is therefore necessary for the *tiers* to declare itself the nation."[3] Another writer, a close observer, wrote:[4] "If this conciliatory

[1] *Récit,* 36–37; Duquesnoy, I, 45–47; *Courrier de Provence, Lettre* VI, 2; Biauzat, II, 80–82.

[2] The commissioners of the commons were in order named: Rabaut de Saint-Etienne, Target, Chapelier, Mounier, Dupont, D'Ailly, Thouret, Le Grande, Milscent, Salomon, Volney, Redon, Viguier, Garat l'âiné, Bergasse, Barnave. See *Récit,* 25; Duquesnoy, I, 27–28; *La révolution française,* XXIII, 443–44; Biauzat, II, 70–71. Those of the nobility: Bouthilier, le duc de Luxembourg, La Queuille (de), d'Antraigues, de Pouille, le duc de Mortemart, de Cazalès, de Bressand. See *Courrier de Provence, Lettre* IV, 19; Biauzat, II, 72. Those of the clergy: L'archevêque de Bourdeaux, l'évêque de Langres, Coster, chanoine de Verdun, Dillon, curé, Richard, Thibault, curé, Lecesve, l'archevêque de Vienne. See *Courrier de Provence, Lettre* II, 10. Biauzat, II, 72.

[3] Duquesnoy, I, 32, 33, 37. Bulletin written on May 22.

[4] *La révolution française,* 367. Under the date of May 18. Also on May 23 (488), the writer expresses the same idea: "Tous les partis ne pensent et ne s'occupent dans ce moment que de la question qui divise les trois ordres. Celui du tiers parâit réunir la très grande majorité des citoyens et l'on pense généralement que les deux premiers ordres seront forcés de se réunir à lui. . . . En tout évènement, on assure que le tiers se constituera en corps national et que la noblesse jouera un mauvais rôle. On dispose les provinces d' après ce principe et ceci merite l'attention la plus sérieuse." *Hérault de la nation,* vol. for 1789, no. 46. In the *Hérault de la nation* of May 22, after the motion of Chapelier is discussed, the writer says, "D' après l'exposition de leur marche, et si la réunion désiré n'a pas lieu, les communes sont, à ce qu'on assure, déterminés à se déclarer l'en-

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undertaking on the part of the *tiers* does not bring about the union of the first two orders with the third, in order to verify credentials and then vote by head upon all questions submitted to the decision of the states general, it appears decided that the *tiers* will constitute itself as a national assembly and act in this capacity without the participation of the first two orders."

The report from the commissioners of the conferences was taken up in the assemblies of the three orders on May 26, but the third estate did not act upon it until May 27. It profited, therefore, by the action of the other orders on the report.[1] The nobility decreed again that the credentials should be verified separately.[2] This decree was read in the assembly of the commons on the morning of May 27 and brought about another attempt of the radical party to organize the assembly.[3] The deputies were indignant that the nobility followed such a two-faced policy as taking part in conciliatory conferences and declaring itself at the same time constituted as a separate chamber, two diametrically opposite plans.[4] Chapelier's motion of May 14 was in substance often repeated and was gaining more supporters. Another step towards the realization of the principle of vote by head was taken on May 27. Mirabeau's advice of May 18 was accepted—the nobility was dropped out of consideration[5]—and

semble de la nation, à se constituer comme ses représentants naturels et légitimes, et en cette qualité, à s'occuper des affaires publiques, conjointement avec ceux de l'église et de la noblesse qui voudront se joindre à elles." Biauzat, II, 88.

[1] *Récit,* 37; *La révolution française,* XXIII, 451–52, 454.

[2] *Récit,* 38; Biauzat, II, 86; Duquesnoy, I, 48: "La noblesse a arreté . . . qu'elle se tenait de nouveau pour bien constitutée, les pouvoirs bien verifiés." *La révolution française,* XXIII, 452. It was announced to the commons by other commissioners that "l'ordre de la noblesse s'était décidément refusé à la réunion, demandé la vèrification en commun des pouvoirs des deputés de tous les ordres."

[3] *Récit,* 38: "Pour cette tenue d'états-généraux, les pouvoirs seront vérifiés séparément, et que l'examen des avantages ou des inconvénients qui pourraient exister dans la forme actuelle sera remis à l'époque où les trois ordres s'occuperont des formes à observer pour l'organisation des prochains états-généraux."

[4] *Récit,* 38; *La révolution française,* XXIII, 454–55: "Cette déclaration a faite une sensation incroyable dans l'esprit de tous les members; un bruit sourd annonçait l'indignation."

[5] *Récit,* 39; Duquesnoy, I, 48: "Toute idée de réconciliation avec la

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since many of the *curés* expressed themselves as willing and even desirous of joining the assembly of the commons, it was decided to wait a short time longer and to bring the greatest pressure to bear upon the clergy in order to persuade them to take the decisive step, to join the assembly of the commons at once.[1] The following summons was drawn up: "Gentlemen, the deputies of the commons invite the gentlemen of the clergy, in the name of the God of peace and of national interest, to unite themselves with those deputies in the hall of the general assembly, in order to consider plans which will bring about concord, that at present is so necessary to public welfare."[2] This proposition was accepted unanimously and was carried to the hall of the clergy by a large number of deputies.[3] This invitation, couched in such solemn language, together with the solemn and imposing deputation, worked like a charm upon the clergy. A large number wanted to accept the summons at once; they did not care to deliberate upon the subject. Nevertheless a violent discussion arose; the *curés* forgot their clerical subordination. The question did not come to a vote, for it was already late in the day when the deputation appeared, and by the next day much of the enthusiasm at first manifested had disappeared; the higher clergy had again control of the chamber.[4] The deputies of the third

noblesse a été rejetée, et jamais la haine contre cet ordre, le mécontentement qu'inspire sa résolution ne s'est si clairement manifesté."

[1] *Récit,* 38–39; *Courrier de Provence, Lettre* VI, 3: "Le 27, plusieurs membres ayant déclaré qu'ils avaient reçu, de la part des ecclésiastiques de leurs baillages, de pressantes invitations pour que les communes fissent auprès de leur ordre une démarche solennelle, qui deciderait infailliblement le clergé, à une réunion dans la salle nationale."

[2] *Récit,* 39; *Courrier de Provence, Lettre* VI, 7; Biauzat, II, 85; Duquesnoy, I, 48; *La révolution française,* XXIII, 454.

[3] *Ibid.*

[4] *Récit,* 39; Duquesnoy, I, 50: "Il paraît que la levée de la séance est l'ouvrage du haut clergé, qui a craint que les curés ne prissent une détermination favorable au tiers. Au reste, je suis convaincu qu'on exagère beaucoup les dispositions des curés, parmi lesquels le plus grand nombre, subjugués par les évêques ou maîtrisés par leurs intérêts personnels, ne se prêteront jamais à l'opinion par tête"; *Courrier de Provence, Lettre* VI, 7; Biauzat, II, 86–88, 91: "Le haut clérgé aperçut sensiblement la disposition des curés à se rendre dans la salle de l'assemblée nationale. En conséquence, et n'ayant pu éluder cette délibération par les délais proposés, il chercha un moyen de rompre la délibération même"; *La révolution fran-*

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estate were disappointed. They had considered this invitation of such vast importance and they knew that in order to bring the *curés* to the general hall it had to be done in the heat of enthusiasm, that some of them decided not to separate until they had an answer from the clergy. But the attempt once more failed. Had the clergy joined at this time, the outcome would probably have been the same as later, namely the union of the three orders.

As it was, the invitation had the effect of stirring up more enthusiasm in favor of the cause of the third estate and also of frightening the privileged classes, who appealed to the king for assistance, and with some success, for the next day a letter from him urged the three orders to renew the conciliatory conferences in the presence of royal commissioners.[1] Thus while the commons believed themselves on the point of escaping from their embarrassments and of reaching a solution of the disputed question, they saw themselves cast back into a series of inextricable difficulties. Mirabeau wrote: "This letter has become the object of the most important discussion which the commons have had so far."[2] Some deputies favored the continuation of the conferences, "but a great number of speakers, and especially the Bretons," opposed further conferences. They gave two rea-

çaise, XXIII, 454–55: "Le tiers a paru persuadé que tous les curés et même quelques évêques étaient décidés à l'adopter sans réserve et sans délai; on attendait d'un moment à l'autre une réponse favorable du clergé et l'on était résolu de ne pas se séparer sans l'avoir reçue. . . . Le tiers est persuadé que le haut clergé a cru prudent et convenable à ses principes de gagner du temps. Cette ruse ne paraît pas l'alarmer. Il compte d'autant plus sur la fermeté des curés, qu'on leur a insinué que, s'ils variaient dans leurs principes, ils feraient sagement de ne plus paraître dans leurs bénéfices. On espère que dans la séance de demain (May 28) la réunion du clergé et du tiers sera arrêtée. Que cette réunion ait lieu ou non, le parti du tiers paraît pris sans retour; il se constitue tout de suite en corps national et s'adresse seulement au roi pour commencer la tenue des états-généraux."

[1] *Récit,* I, 42; *Courrier de Provence, Lettre* VII, 2; Duquesnoy, I, 52–53; Biauzat, II, 91. Biauzat says that during the night of May 27 to 28 from twenty-five to thirty bishops met and agreed to ask the king to use his authority or his influence in favor of the continuation of the conferences.

[2] *Courrier de Provence, Lettre* VII, 3: "Cette lettre est devenue l'objet de la plus importante délibération qu'aient encore débattée les communes;" Duquesnoy, I, 53; *La révolution française,* XXIII, 455–57. When a committee of the clergy announced to the commons that the king had sent a letter, the writer says: "Pour se faire une idée de la surprise du tiers-état et des

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sons: the uselessness of the conferences was well demonstrated, and, secondly, they feared that the king, in taking up the matter, might wish finally to decide the question which the representatives of the nation alone should decide; they desired that the assembly "constitute itself at once as national assembly."[1] Had the leaders at this time championed the demand for action, they might have been successful, but they saw more clearly than ever the advantages of delay and the inconveniences that might result from a refusal. The leaders feared to alienate at the same time the government and public opinion, to compromise the future by appearing too arbitrary. Even Chapelier counseled compliance with the wishes of the king. His motion was a curious one. He, as well as Mirabeau, saw that the king had to be reckoned with, and they favored the sending of an address to the king in which it should be assumed that he had convoked a national assembly which was indivisible.[2] Mirabeau proposed: "The king has addressed to us a homage filled with goodness; let us present to him an address full of love, an address in which we consecrate

murmures que la députation a excités dans la chambre, il faut en avoir été témoin. Il n'y avait qu'une voix pour se plaindre de la conduite du clergé, de ses ruses et de ses perfidies. Revenus de leur étonnement, quelques membres ont fait des motions relatives à l'objet de la députation."

[1] Duquesnoy, I, 53: "Mais un grand nombre de voix, et notablement les Bretons, s'opposèrent à ce qu'on assistât aux conférences: °1 à raison de leur inutilité démontrée; 2° dans la crainte que le roi ne prononcât sur une question que la nation doit seule juger, et ils voulaient que l'on se constituât à l'instant en *assemblée nationale.*" *Archives parlementaires,* VIII, 58; *Courrier de Provence, Lettre* VII, 2; *La révolution française,* XXIII, 456–57.

[2] *Récit,* 46–48: "Il sera fait à Sa Majesté une très humble adresse, pour lui exprimer l'attachement inviolable de ses fidèles communes à sa personne sacrée, à son auguste maison, et aux vrais principes de la monarchie; pour témoigner à Sa Majesté leur respectueuse reconnaissance de ce que, dans sa sagesse et sa bonté pour ses peuples, Sa Majesté a convoqué, non trois assemblées distinctes de trois ordres séparés d'intérêts et de vues, mais *l'assemblée nationale,* . . . les communes du royaume ont autorisé leurs commissaires à assister à la conférence à laquelle Sa Majesté a daigné les inviter, et l'informer en même temps qu'intimement convaincues que les députés des différents ordres sont députés à une seule et même assemblée, *l'assemblée nationale,* la vérification de leurs pouvoirs ne peut être définitivement faite et arretée que dans *l'assemblée nationale;* et déterminées, comme elles y sont obligées par les ordres de leurs commettants, à ne reconnaître pour députés à *l'assemblée nationale* que ceux dont les pouvoirs auront été vérifiés et approuvés dans ladite assemblée. . ." Chapelier favored the constitution of the conferences asking that the commissioners

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both our sentiments and our principles."[1] Some deputies made mention of the fact that on that very day—in the morning session of May 28—the assembly of the nobility had formally declared itself in favor of orders, and that it would persist in upholding this principle. These deputies maintained that a continuation of the conference was entirely useless, that every attempt to conciliate the nobility would fail.[2] The clergy, and the nobility too, accepted the king's request to continue the conferences.[3] The commons did the same, though with great reluctance and on the condition that "of each session a *procès-verbal* shall be drawn up and signed by all those who have taken part in the conferences, in order that the conferences may not be called into question."[4] The deputies of the third estate accepted the king's invitation because it was policy for them to do so; they did not wish, nor could they afford, to be considered obstinate by the public.

The conferences were renewed, the commissioners of the king being present.[5] Seemingly trivial matters were discussed, such as whether the minutes of the sessions should be kept. There was disagreement in regard to having a secretary, and, after it was decided that there should be one, a discussion ensued as to whether he should be chosen from one of the commissioners

of the commons "feront tous leurs efforts pour que cette conférence ait lieu dans la salle commune . . . lorsqu'il s'agit des droits les plus précieux des communes, elles ne peuvent prendre ni juges ni arbitres." *La révolution française,* XXIII, 458; Duquesnoy, I, 53–55; *Courrier de Provence, Lettre* VII, 13.

[1] *Courrier de Provence, Lettre* VII, 4; Duquesnoy, I, 56.

[2] *Récit,* 44; *La révolution française,* XXIII, 457: "Qu'a voulu dire le roi en nous annonçant ses intentions de vouloir contribuer directment à une harmonie si désirable et si instante? Nous sommes les maîtres des moyens à employer et son intervention est préjudiciable à nos droits. Que produiront de nouvelles conférences? Le parti de la noblesse est pris et la trahison du clergé est manifeste."

[3] Duquesnoy, I, 52; Biauzat, II, 96.

[4] *Récit,* 48–49, 57–58; *Courrier de Provence, Lettre* VII, 14, 15; Biauzat, I, 89–90, 93; *La révolution française,* XXIII, 458–59; Duquesnoy, I, 56.

[5] *Récit,* 56–59, 64–68, 68–74. The king's commissioners were: MM. le garde-des sceaux, "le duc de Nivernais, de la Michodière, d'Ormesson, Vidaud de la Tour, Chaumont de la Galaizière, le comte de Montmorin, Laurent de Villedeuil, le comte de la Luzerne, le comte de Puysegur, le comte de Saint-Priest, Necker et Delessart." Biauzat, II, 94–95.

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or from outside the assembly. The deputies of the nobility most resolutely refused their signature to the *procès-verbal,* if the commissioners of the third estate gave to their order the title of *communes.*[1] Bailly wrote:[2] "To call themselves the *communes de France* was, in the eyes of the nobility and of the clergy, almost the same as to call themselves *la nation.*" The deputies of the third estate from the very opening of the states general had assumed the name of commons; they did not wish to appear the deputies of the third estate and they opposed the idea that the nation consisted of three estates. France was a nation, one estate, and they claimed that all the deputies to the states general, or the national assembly, equally represented this nation. The fact that the deputies of the third estate called themselves the commons is very significant; it shows how and what they considered themselves, and it helps to explain their purpose in this struggle with the other orders.[3]

After the commissioners of the nobility had wearied the other commissioners by raising objections to their requests, the real question was considered. The old arguments in regard to the verification of credentials were repeated until all the commissioners became utterly impatient with the discussion.[4] Finally on

[1] *Récit,* 64, 89–93; *La révolution française,* XXIII, 522–23, 471; Duquesnoy, I, 69–70; Biauzat, II, 95; Bailly, I, 95, 97–99, 104–7.

[2] Bailly, I, 95.

[3] The Breton deputies, being organized, had perhaps the most advanced ideas; they had a great influence upon the assembly. In the *cahier* of the *Sénéchaussée de Rennes,* (*Archives parlementaires,* V, 538) article two, we read: "C'est par une erreur funeste que ce qu'on appelle le tiers-état, ce qui compose plus des quatre-vingt-dix-neuf centièmes de la nation, a été qualifié d'ordre et mis en balance avec deux classes de privilégiés! Cette erreur doit cesser, et ce qu'on à jusqu'ici nommé le tiers-état dans le royaume, sera compris avec ou sans les privilégiés sous la même dénomination et appelé peuple ou nation, seuls noms qui soient véritables et qui puissent convenir à la dignité du peuple; cette dignité sera toujours présente aux yeux de ceux qui auront l'honneur de la représenter; ils ne souffriront pas qu'il reçoive nulle part dans leur personne ou autrement aucune humiliation . . ." Article four: "Toutes délibérations définitives seront prises dans l'assemblée générale, et par tête, la délibération par classe des privilégiés ne pouvant qu'anéantir l'esprit public, faire dominer l'esprit de corps, multiplier des querelles, mettre un obstacle éternel aux lois et aux réformes les plus nécessaires; enfin soumettre vingt-cinq millions d'hommes aux despotiques volontés de quelques milliers d'individus."
See also *Archives parlementaires,* IV, 94, the *Sénéchaussée de Nantes.*

[4] *Récit,* 93–94; Bailly, I, 107: "La noblesse disputait le terrain pied à

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June 5, Necker proposed a project which he thought would conciliate the three orders.[1] But this plan, that he called an *ouverture,* was really to the disadvantage of the third estate, and instead of conciliating the commons it aroused them to action. It really favored separate verification of the credentials. A stormy debate arose in the hall of the third estate as to whether Necker's plan of conciliation should be considered *before* or *after* the closing of the *procès-verbal* of the conferences, and it was decided by a vast majority that it should be taken up for discussion only after the conferences were terminated.[2] It was expected that they would last but a few days. This postponement meant that Necker's plan should not be considered at all, for how could a subject of the conferences be considered after their close? The commons did not grant the government any opportunity to interfere in the affair of the verification of credentials and of the vote by head or by order. They were ready to organize and were only waiting for the end of the conferences and the signing of the *procès-verbal* by the commissioners in order to act. They thought that the minutes signed by all the commissioners would justify their action in the eyes of the public and that it was, therefore, important to wait. The clergy adopted the *ouverture,* but the nobility accepted it only conditionally, which was in fact a refusal.[3]

The third estate saw this subterfuge. They considered the *ouverture* as an interference on the part of the government in a question that pertained strictly to the deputies of the states general and they became alarmed, because there were rumors of a royal session in which the king would dictate his wishes to the three orders.[4] On the morning of June 6, the commons began the discussion of measures preparatory to organization, so that

pied, et c'est ce qui fatiguait les communes, c'est ce qui semait l'aigreur et préparait tous les maux . . ." *Courrier de Provence, Lettre* IX, 2–11. Mirabeau analyses the project and gives the king's purpose.

[1] *Récit,* 74–78; *La révolution française,* XXIII, 469–70; Duquesnoy, I, 71.

[2] *Récit,* 78–79; *La révolution française,* XXIII, 470–71; Duquesnoy, I, 72–73; *Courrier de Provence, Lettre* IX, 2; Biauzat, II, 93.

[3] *Récit,* 81, 86; Duquesnoy, I, 71, 74; Biauzat, II, 96; *La révolution française,* XXIII, 520.

[4] Ford, P. L.: *The Writings of Thomas Jefferson,* V, 99–101; Letter

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in case of an emergency they could constitute themselves and act instantly.[1] A deputy proposed rules of order for the government of the assembly and rules which should regulate the manner of presenting the motions, the debates, and the voting. But the assembly was interrupted in this work by the appearance of a deputation from the clergy which announced that the king's *ouverture* was accepted by their order.[2] Various other questions presented themselves so that the matter of organization had to be set aside. Later in the day the same committee of the clergy presented itself with a proposition which called forth from many members of the third estate expressions of disgust against the clergy.[3] It convinced many deputies, who heretofore had believed in the coming union of the deputies of the third estate and of the clergy, that it was necessary for the commons to organize and to constitute themselves alone, that they could no more depend on the clergy than on the nobility.[4] This committee announced that the clergy was "profoundly touched by the misery of the people and by the high price of grain which afflicted the provinces," and they proposed that the three orders should appoint committees who together should consider plans for the alleviation of that evil.[5] "A general murmur" and "the most profound silence succeeded" this proposition. The note was read once more when the committee had left the hall. Then various motions were made, such as to ignore the proposition or to consider it only after the assembly was constituted; again, that it

written on June 3, 1789; *La révolution française,* XXIII, 363. Troops were assembled in the neighborhood of Paris.

[1] *Récit,* 81; *Courrier de Provence, Lettre* X, 1.

[2] *Récit,* 81; *La révolution française,* XXIII, 520.

[3] *Récit,* 84; the commons were already discontented, because of the king's *ouverture,* and, furthermore, they had been humiliated by the king. *La révolution française,* XXIII, 469; Duquesnoy, I, 65, 70.

[4] Duquesnoy, I, 76–77: "Le clergé a cherché à tendre un piége dans lequel il est tombé lui-meme. . ." *La révolution française,* XXIII, 521, 523: "L'effet de cette députation a été de soulever tous les membres du tiers-état. La commotion a été générale et tenait de l'effervescence, du délire. Jamais, non jamais, la chambre n'a été dans une telle agitation. Les motions faites à ce subjet sont extrêmes."

[5] *Récit,* 84; *Courrier de Provence, Lettre* IX, 16; Biauzat, II, 96; Duquesnoy, I, 76; *La révolution française,* XXIII, 521.

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was necessary to answer it at once; but a third party saw the intentions of the framers of the clergy's plan, namely to entrap the deputies of the third estate. A deputy explained the evident purpose of the proposition: to accept the plan would cause delay in constituting the assembly, and delay would have its evil and irreparable consequences. But rejection would drawn down the disfavor of the king upon the assembly, and the public would accuse the commons of being the cause of the misfortunes and of being insensible to the public misery: "they will lose the confidence of the people, and with it the means to help them."[1]

Invectives against the clergy were not spared. It was proposed to denounce their resolution to the king and to the nation as seditious.[2] "Complaints against their wiles were heard, and against their perfidies, against their enormous riches and against the scandal which was produced by the employment of their wealth. It was said that the property of the clergy belonged to the poor and that it ought to go to them."[3] This violence must have spurred the higher clergy to greater opposition to the cause of the third estate. The expressions used against the clergy in this heated discussion pointed already to the abolition of the feudal rights of the famous night of the 4th of August. But the deputies of the third estate soon saw the advantage of calmer deliberation and, artful as was the device of the clergy, the assembly of the commons contained men who could meet the emergency. It was suggested that before the consideration of the proposition of the clergy, the commons should summon the deputies of the clergy to present themselves in the hall of the states general and unite themselves with the commons in order to consider plans which might result in relieving the poor. It was argued that, in case the clergy did not accept the invitation, their

[1] *Récit,* 84–86; *La révolution française,* XXIII, 521; Biauzat, II, 96: "On croyait les deux parties également dangereuses pour le tiers-état . . . s'occupant d'affaires d'administration et y travaillant par commissaires nommés séparément par les chambers, on entrait en exercise d'états-généraux; . . . et l'on entrait en exercise en chambres distinctes, ce que le tiers-état voudrait éviter, parce qu'il il craint de consacrer des abus."

[2] *Récit,* 85.

[3] *La révolution française,* XXIII, 521; *Récit,* 85; Dumont, 63, 64; *Moniteur,* I, 56–57.

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true disposition in this matter would be discovered and their resolution would seduce nobody; and if, on the other hand, they should accept the invitation, the assembly of the commons would accomplish its end.[1] The dean read a project to be sent to the clergy. It was received by the commons with lively and repeated applause[2] and was carried to the hall of the clergy by a solemn deputation, but the attempt was again unsuccessful.[3] There was left now no hope whatever of bringing all the deputies together in the assembly by peaceful means; the third estate could only wait for the conclusion of the conferences in order to organize as an active assembly. The conferences were closed on June 9.

But in the meantime preparations for the final step were made. Some members were restless and wanted to organize at once. Malouet proposed that the assembly should begin to verify the credentials of its members and constitute itself immediately thereafter.[4] But the most of the deputies considered Malouet's motion premature and were wise enough to wait. They occupied themselves with rules of order and formed themselves into twenty committees, so that the organization, once begun, could be carried on expeditiously.[5]

When the dean at the opening of the session of June 9 asked if there was any business, all were silent. No one ventured to speak. It was the calm before the storm. But it was necessary to kill time, as the conciliatory conferences closed that day, and so the records of the last conferences were read a second time. The details in the arrangement of the committees were fixed.[6]

[1] *Récit,* 85; Biauzat, II, 97; *Courrier de Provence, Lettre* IX, 17.

[2] *Récit,* 87; Biauzat, II, 97.

[3] *Récit,* 87.

[4] *Récit,* 96–97; *Courrier de Provence, Lettre* X, 2; Biauzat, II, 99; Duquesnoy, I, 79–80; *La révolution française,* XXIII, 523–24.

[5] *Récit,* 96, 97, 99; Biauzat, II, 99; *Courrier de Provence, Lettre* X, 1, 2; Duquesnoy, I, 79, 80; *La révolution française,* XXIII, 523, 524.

[6] Biauzat, II, 101: "Il n'est pas même levé un seul député. L'on ne sera par surpris de ce silence lorsque l'on saura que nous étions tous tenus dans un état d'indecision par des demi-ouvertures que l'on se faisait comme secrètement de quelques trames qui s'ourdissent pour la dissolution des états-généraux. L'importance de l'objet et l'incertitude des annonces formaient un embarras dans les bonnes têtes, et personne n'osait parler. Cependant il faillait tuer le temps."

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On the evening of this day, the committees met and considered the question of constituting the assembly, and five-sixths of them agreed that the proper time for action had come.[1]

After the bureaux had adjourned, many of the deputies and deputations met in order to still further discuss the all-important subject. The Breton meeting especially was largely attended. Boullé writes on June 10 that at nine o'clock the evening before, after he left his bureau, he "went to the hall of the Breton deputies; it was truly the temple of patriotism this evening; all the good citizens of all the provinces were assembled there. The means of constituting ourselves as an active assembly were examined and discussed, and it appears that the plan of M. l'abbé Sieyès is almost generally approved."[2] Sieyès' plan had been considered in the hall of the Breton deputies, which had become the rallying place for a large number of deputies of other provinces as well, on the evening of June 8. During the following day and evening most of the deputies of the *tiers-état* were informed of it.[3] Those who up to this time had remained undecided were now convinced that organization was necessary and that further delay was dangerous, for it was widely believed that a royal session was to be held in the near future. The commons

[1] Biauzat, II, 102: "On a indiqué un local pour la tenue de chacun de ces bureaux. Les députés se sont rendus chacun en son bureau, sur les 5 à 6 heures du soir, pour y conférer sur le projet de règlement dressé par les commissaires. . . . Il a été question, dans plusieurs bureaux et dans presque tous, de la nécessité de nous constituer. Les cinq-sixièmes au moins pensent que le moment est venu de faire cette demarche." *La révolution française,* XXIII, 528. The bureaus were to meet on the evening of June 8: "L'assemblée s'est séparée et les bureaux se sont ajournés pour ce soir. Plusieurs étaient indiqués dans l'hôtel du grande-maitre. Quelques députés s'y sont présentés: ils ont été éconduits par les Suisses, qui les ont assurés n'avoir aucun ordre pour les recevoir. Trois bureaux seulement se sont réunis dans l'enceinte de la salle générale. On y a parlé de constitution et nous avons appris de bonne part que le résultat des conférences sur cette matière n'était pas de se constituer en chambre nationale, mais simplement en chambre des communes faisant les fonctions des états-généraux, jusqu'à la réunion des deux premiers ordres; c'est la modification qu'on se propose de présenter à l'assemblée; c'est déjà quelque chose. le temps achèvera le reste." *La révolution française,* XXIII, 525.

[2] *Revue de la révolution,* XII, *Documents inédits,* 49.

[3] *Ibid,* 40.

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were therefore, on the morning of June 10, almost unanimously in favor of constituting themselves.[1]

II

At the opening of the morning session of the commons on June 10, the dean announced that the *procès-verbal* of the conferences had been closed and signed by the eight commissioners of the clergy, by those of the commons, and by the secretary, and that it had been recorded in the minutes that the commissioners of the nobility had declared the *procès-verbal* exact in all its parts. The assembly by acclamation ordered the printing of these minutes. The dean stated further that, according to a previous decision of the assembly, the *ouverture* of conciliation, made by the king's commissioners, was to be considered after the termination of the peace conferences and the closing of the *procès-verbal,* and that the deliberation on the conciliatory plan was, therefore, now in order. He advised, however, that the discussion be postponed until the following day. He alleged as a reason for delay that the *procès-verbal* of the conferences of the preceding evening had not yet been laid before the assembly. But why did he not call for the report of the commissioners at once? The deputies favorable to the motion of Sieyès had requested and obtained from the dean this omission that the additional time might be given to the consideration of the proposed plan.[2]

[1] Biauzat, II, 102: "Des conférences qui ont succédé aux bureaux et qui ont duré jusqu' après onze heures, ont rangé à cet avis le plus grand nombre de ceux qui étaient demeurés indécis jusqu'alors. Pour donner plus de poids à la motion qui doit conduire à ce but, on doit la faire présenter par M. l'abbé Siés (Sieyès)"; *La révolution française,* XXIII, 525: "On s'en occupera demain, si le procès-verbal des conférences est définitivement signé dans la réunion de ce soir. Plusieurs membres ont préparé des motions à ce subjet. On sait que M. l'abbé Sieyès doit en faire une et l'avis qu'on en a rendra l'assemblée plus nombreuse qu'à l'ordinaire. . . ." Duquesnoy, I, 83: Duquesnoy wrote in the morning of June 10, "C'est aujourd'hui qu'on doit déliberer sur la constitution." Sieyès, soon after his arrival at Versailles, associated with the Breton deputies who knew of him because of his monograph: *Qu'est-ce que le tiers-état?* See Zinkeisen, I, 62; Chérest, III, 119–22, 133, note, and 145; Aulard: *La société des Jacobins,* I, Introduction, II.

[2] *Récit,* 79, 100, 101; Biauzat, II, 102; *La révolution française,* XXIII,

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The whole assembly was eager to hear what Sieyès had to say. But, now that the time had come, Sieyès seemed to hesitate. He should have taken the floor immediately after the dean's first statement. When he let the opportune moments slip by, Mirabeau became impatient, and when Sieyès kept the assembly in suspense after the dean's second remarks, which really were a suggestion to Sieyès, Mirabeau, to give him courage, called upon him, and stated[1] that the commons, in order not to expose themselves to the greatest dangers, must hesitate no longer; they must take a decisive step; and he concluded with the announcement that a deputy from Paris wished to propose a motion which was of the greatest importance. The assembly expressed its desire to hear the motion, and the dean called upon Sieyès.

It was in the midst of a profound silence that the famous deputy from Paris began his discourse. The session was well attended by the public, for it was known that the conference had been closed and that important business would be considered.[2] Like Chapelier and others who had made similar motions before, Sieyès reviewed the action of the deputies of the third estate since the opening of the states general, and their relations with the clergy and with the nobility.[3] He described the circumstances that had prevented the organization of the states general, the proofs of good-will given by the commons, the obstinate resistance which they had encountered on the part of the other orders, the uselessness of the conferences, and the obstacles placed by the nobility in the way of every attempt at conciliation. He concluded that the commons could no longer remain in inactivity without neglecting their duties and without betraying the interests of their constituents. It was necessary to begin work. But it was impossible to form an active assembly, to constitute them-

526; *Revue de la révolution,* XII, *Documents inédits,* 50, 51; *Journal des états-généraux,* I, 53.

[1] *Récit,* 101.

[2] *La révolution française,* XXIII, 525, 526; Duquesnoy, I, 83; Biauzat, II, 102; *Revue de la révolution,* XII, *Documents inédits,* 39, 40, 49.

[3] *Récit,* 101–3; *Journal des états-généraux,* I, 53–56 (paging for the month of June); *La révolution française,* XXIII, 526; Duquesnoy, I, 83; Biauzat, II, 102, 103, 105–7; *Courrier de Provence, Lettre* X, 3–7; *Revue de la révolution,* XII, *Documents inédits,* 51, 52.

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selves, until they knew who should compose the assembly. The assembly had proved that the credentials could be submitted to no other judgment than that of the representatives of the nation collectively, and this principle, the truth of which was so well demonstrated in every page of the *procès-verbal* of the conferences, should not be abandoned. The nobility had refused the *ouverture* of conciliation, and by this act the commons were absolved from considering it, because the rejection of one party to a conciliatory plan annulled the plan. The assembly was therefore forced to act, and it could do nothing else than "summon the members of the two privileged chambers to present themselves in the hall of the states, in order to assist in, to concur in, and to submit themselves to the common verification of credentials."

After this brief exposition of the motives for action, Sieyès read the motion which has remained inseparably linked with his name. It explained the reasons for action and the objections against delay. The nation demanded from its deputies the best employment of their time. "The assembly considers it a pressing duty for all the representatives of the nation, no matter to what class of citizens they belong, to constitute themselves, without further delay, an active assembly in order to fulfil the object of their mission." The conciliatory commissioners were charged to draw up "an account of the long and vain efforts of the deputies of the commons for the purpose of converting the privileged classes to the true principles," to explain the reasons which forced the commons to action, and then to publish the account "as an introduction to the present resolution."

"But since it is impossible to form an assembly without a preliminary recognition of those who have the right to compose it, that is to say, those who are empowered to vote as representatives of the nation, the same deputies of the commons believe that they ought to make a final appeal to the deputies of the clergy and of the nobility who claim to possess the same powers, and who nevertheless have refused, so far, to allow themselves to be recognized.

"Furthermore, it is in the interest of the assembly to fix the

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responsibility by putting on record the refusal of these two classes of deputies, in case they persist in the desire to remain unrecognized; the assembly thinks it indispensable to send a last invitation, which shall be presented to them by deputies who shall be charged to read it to them and to leave them a copy which is as follows:

" 'Gentlemen, we are charged by the deputies of the commons of France to inform you that they can not longer postpone the discharge of the obligations thrust upon all the representatives of the nation. It is certainly time that those who claim to be representatives should be recognized by a common verification of their credentials, and should begin at last to occupy themselves with the interests of the nation, which alone, and to the exclusion of particular interests, present themselves as the great end for which all the deputies ought to strive with a common effort. Consequently, and since it is necessary for the representatives of the nation to constitute themselves and act without further delay, the deputies of the commons invite you, gentlemen, anew, and their duty forces them to extend to you, individually as well as collectively, a last summons to come into the hall of the states in order to assist in, to concur in, and to submit yourselves like the commons to the common verification of credentials. We are also charged to inform you that the general call of all the *bailliages* convoked will be made in an hour; that immediately after the roll-call the credentials will be verified and default pronounced against those who do not present themselves.' "[1]

Immediately after reading the motion and the summons Sieyès explained that he had presented only the first part of his plan. The question at that moment was not how and with what powers the commons should constitute themselves. Such active resolutions were impossible until it had been determined what men were legally elected to the states general and had a right to take part in the organization. As soon as the preliminary step

[1] *Courrier de Provence, Lettre* IV, 58. When Mirabeau on May 15 compared the motions of Rabaut and Chapelier, he brought out the idea of default against the orders; *La révolution française*, XXIII, 452–53. This same idea was expressed May 26, 1789, in the *Bulletins d'un agent secret*

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to organization had been taken, that is, as soon as the credentials had been verified, he would present the second part of his plan. Furthermore, to enter default against those who would not present their credentials would neither establish nor announce a schism between the orders; that the clergy and the nobility could at any time raise the ban by uniting themselves with the commons, who would always gladly receive them.[1]

Sieyès was enthusiastically applauded.[2] The motion answered to the general wish; it soothed the feeling of impatience that had seized upon even the calmest spirits. All the members of the assembly were familiar with the question, for it was the subject that had been most widely discussed, and, since the opening of the states general, had received the most serious consideration. Being thus prepared and having expected it, many members rose instantly in support of the motion.[3] With much force and ability they developed the reasons which should determine the commons to follow the course suggested by Sieyès. The rational moderation which had so wisely guided the actions of the third estate in this long and fierce struggle with the privileged classes up to June 10 did not forsake the assembly in the discussion of this revolutionary step. The equable and judicious Target suggested that, since the assembly was not yet constituted,[4] not *dernière sommation,* but *dernière invitation;* not *donné défaut contre les non-comparants,* but that it will proceed to the verification, as much *en présence qu'en l'absence des députés des classes privilégiés,* not *dans une heure,* but *dans le jour* would be a more

[1] *Récit,* 104; Biauzat, II, 102–3: "Il y a ajouté un développement verbal pour faire apercevoir qu'il n'entendait pas nous proposer de nous constituer à l'instant ou de nous constituer dans la suite, en assemblée national dont les députés ecclésiatiques et nobles seraient exclus, ni en assemblée des communes qui sont l'assemblée nationale, moins les ecclésiastiques et les nobles, ni enfin en ordre distinct et séparé, mais en députés des bailliages et représentants de nos commettants, pour le nombre qu'ils forment dans l'assemblée de tous les Français."

[2] *Récit,* 104; *La révolution française,* XXIII, 526; *Revue de la révolution,* XII; *Documents inédits,* 52, 53.

[3] Duquesnoy, I, 83.

[4] *Récit,* 104; Biauzat, II, 103. Biauzat says that he himself made the suggestion of the changes. Duquesnoy, I, 84; *Moniteur,* I, 64, Target's speech; Chérest, III, 135.

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fitting phaseology. Sieyès readily consented to these rational changes.[1]

But the assembly of the commons was not even yet a complete unit on this question of organization. There were opponents, though but few, who caused more or less agitation. At first they had kept silent; then they attempted to impede the action of the assembly by keeping up the debate. But they made themselves obnoxious; they exhausted the patience of the deputies; they were violently and systematically attacked, hissed, and their voices even drowned by the clamor of the vast majority.[2] The opposition began by the declaration of a member that the motion was dangerous. He advised the adoption of the king's *ouverture de conciliation,* but this opinion found no support; it met with an organized attack. A Breton deputy said that it was a question of the very greatest importance to depart from a *laissez faire* policy, and it was folly to propose a course which must come to nothing since the nobility had rejected the *ouverture.* The request that the *ouverture* should be considered by the assembly was answered from all parts of the hall by the assertion that the discussion could lead to nothing, that it was entirely useless.

A deputy from Artois said[3] that he favored Sieyès' motion, but added that it should contain the refutation of some of the principles expressed in the preamble of the *ouverture* against which an express protest seemed indispensable. He was answered that such objections were unnecessary as the *procés-verbal* of the conferences had taken account of those principles in the most satisfactory manner. But the deputy from Artois insisted; his amendment was supported by several members. Two other deputies urged that the assembly should wait until the clergy made reply to the last invitation of the commons.[4] But the

[1] *Récit,* 104, 108; *Journal des états-généraux,* I, 58–60; Biauzat (II, 103) says that he suggested the changes and the *Récit* that it was "un député de Bourgogne." See motion as adopted, *Récit,* 110–12.

[2] *Courrier de Provence, Lettre* X, 11; *La révolution française,* XXIII, 526; Duquesnoy, I, 84; *Récit,* 104–9; *Revue de la révolution,* XII, *Documents inédits,* 53, 54.

[3] *Récit,* 105, 106; Biauzat says (II, 103) that M. Camus, a deputy from Paris, made this amendment.

[4] *Récit,* I, 84–87. The invitation of June 6, that was called out by the clergy's deputation in regard to the relief of the poor.

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answer to such a proposal was that it was altogether too indefinite. Again it was suggested that, since the policy of the clergy towards the commons had always been different from that of the nobility, the invitation to them should be worded differently. Mirabeau, who on former occasions had advised that the attitude of the commons toward the clergy should be different because of the different attitude of the clergy towards the commons, opposed this policy now. He agreed that the methods employed by the two orders in dealing with the commons were not the same, but that there was no difference really in their pretensions and in the result of their conduct. Both orders had remained apart from the commons; the last invitation to both orders was therefore equally indispensable. The phraseology in which the invitation was couched presented the motives upon which it was founded and the efforts which it was expected to produce. The motives for, and the effects of, the invitation were the same in regard to the clergy and to the nobility. The invitations, therefore, should be absolutely the same. If a different course were followed some inconveniences would certainly result from it. Mirabeau silenced the opposition. But now another member proposed that, together with the resolution of Sieyès, an address should be prepared and presented to the king.[1] This address should deal with the king's *ouverture de conciliation* and explain the course which the commons had been forced to follow. This amendment was well received. However, a deputy remarked that the king was perfectly well informed, that he knew of the refusal of his plan by the nobility and that, therefore, the address was useless. Furthermore, it would delay the action on Sieyès' proposition, which was indeed very urgent. The author of the amendment now hastened to state that Sieyès' motion ought to be adopted at once, but that it was also in the interest of the assembly to present an account of its policy to the king and to inform him of the motives that had determined the decision of the commons.

When, at last, the debates seemed terminated, another member

[1] *Recit,* 106–7; *Journal des états-généraux,* I, 62; *Courrier de Provence, Lettre* X, 8; Duquesnoy, I, 84; *Revue de la révolution,* XII, *Documents inédits,* 53; Biauzat, II, 103. Biauzat says Lavenüe de Bazas.

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asked that the motion be printed and that a copy be given to each representative, or at least that a copy should be sent to each of the twenty bureaus, where it could be examined and discussed anew. But the assembly was irritated by these repeated interruptions and delays; a general murmur of indignation arose against this proposition. A deputy from Metz[1] answered that the commons had tried all the means that the most ardent love of peace could dictate, and in spite of that they had met and still met with nothing but obstinate resistance to a demand founded upon the first principles of equity and reason; that, after five weeks of waiting, it was at last time to abandon a policy of inactivity; that Sieyès' motion embodied the only proper and legal course which the assembly could take; and that he was astonished that this motion could still meet with opposition, that it had given occasion to such debate; and a further demand for delay was certainly revolting in the extreme.[2]

The dean, encouraged by the almost universal and spirited applause which followed these remarks, declared the discussion closed.[3] He was, however, interrupted by a deputy who demanded a double roll-call.[4] It had been the custom of the assembly to give all members on a first roll-call an opportunity to speak and on a second roll-call to collect the votes.[5] This plan had been followed, of course, only when important questions were considered; and the assembly up to this time had acted upon the principle that it had a great deal of time. But a unanimous objection might deprive a speaker of the floor. The assembly expressed anew its impatience; the speaker could not make himself heard. The dean put the motion with the changes consented to by its author. He added two amendments:[6] (1) to express to

[1] *Récit,* 107–8; Chérest, III, 137–38. Chérest thinks that this deputy from Metz was M. Emmery.

[2] *Ibid.,* 108: "Et que dès lors la proposition de l'impression et du renvoi de la motion dans les bureaux était révoltante sous tous les points de vue."

[3] *Ibid.*

[4] *Ibid.*

[5] *Ibid.,* 22–24, 44–45; Duquesnoy, I, 57.

[6] *Récit,* 108: "1. Exposer au roi les motifs de la deliberation. 2. Réclamer contre les principes du préambule de l'ouverture de conciliation";

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the king the motives for the action taken, and (2) to record objections against the principles expressed in the preamble of the *ouverture de conciliation.* According to Camus, 247 votes were in favor of the motion without any amendment, 246 votes for the motion with the first amendment. The remaining fifty-one votes were distributed among the rejection of the motion, its adoption with both of the amendments, and the reference of the motion to the bureaus.[1] The vote was therefore not decisive. It was felt that a majority vote was absolutely necessary to the adoption of such an important plan. The dean put an end to further debate by announcing another session at five o'clock in the evening, at which time the question should be decided.

In the evening session, a Breton deputy stated[2] that he had voted for the motion, pure and simple, for the reason that the matter of the address to the king could be considered after the passing of the motion, but he thought that those who had voted as he had done would vote for the address also. The question was put to the assembly and was almost unanimously accepted. In order to make the vote as decisive as possible and to render the general wish more evident, the dean asked that all those who had voted for the unamended motion and opposed the first amendment should rise. Only three members rose, so that in this manner the motion, together with the first amendment, was almost unanimously adopted.[3] "In this manner," says Bailly, "was terminated, to the satisfaction of the assembly, the first of the most important deliberations; it is the first step which the assembly has taken towards its lofty destinies; the resolution contains the germs of all the great achievements of the month, and in it may

Courrier de Provence, I, 175; Biauzat, II, 103–4; Duquesnoy, I, 84; *Revue de la révolution,* XII, *Documents inédits,* 54.

[1] *Récit,* 108–9, has the figures given in the text. *Courrier de Provence, Lettre* X, 10; Biauzat, II, 104. Biauzat doubts the truth of this count and gives it together with another count by M. Populus: "De cinq cent vingt-cinq, il y en a eu cent quatre-vingt-quatorze pour admettre la motion pure et simple, deux cent quatre-vingt-dix pour admettre la motion avec le premier amendement, une seule pour rejeter la motion." *Revue de la révolution,* XII, *Documents inédits,* 54.

[2] *Récit,* 110.

[3] *Récit,* 110; *Courrier de Provence, Lettre* X, 11; *Revue de la révolution,* X, *Documents inédits,* 54.

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be discovered the essential principle which is the basis of the constitution."[1] It was agreed that the resolution and invitation as finally adopted should be drawn up at once and signed by the dean and his assistants. The assistants were instructed to carry the invitation and resolution to the two privileged orders at the opening of the next session, June 12. The conciliatory commissioners and Sieyès were charged to prepare the address to the king.[2]

June 11 was Ascension Day and no session was held. This was a great disadvantage to the commons, for the enthusiasm with which their resolution would have been received by the lower clergy was checked by the delay. Duquesnoy, writing on June 11, complained of the long discussions on June 10 in the hall of the third estate, and he did so with reason.[3] Had the invitation been sent during the morning session of that very day, the probabilities are that a large proportion of the clergy would have united at once with the commons. The assembly of the clergy was divided into two groups, the higher and the lower clergy. The higher clergy favored the nobility; the lower clergy, or *curés*, the commons.[4]

On June 12, the ten, going to each chamber, delivered their message.[5] The assembly of the nobility, through its president, answered the deputation of the commons that it would consider the invitation and send its answer.[6] The deputies of the commons, while waiting for an answer to the invitation, considered the address to the king. A heated discussion arose upon the question as to whether the address should be read in the open assembly. But the debate was interrupted by a deputy from Paris, who called attention to the fact that it was now more than ever in the interest of the assembly to constitute itself and to begin work

[1] Bailly, I, 134.

[2] *Récit*, 110–13.

[3] Duquesnoy, I, 84.

[4] *Mémoires du marquis de Ferrières*, I, 48; *La révolution française*, XXIII, 448.

[5] *Récit*, 114–16; Duquesnoy, I, 86; *Courrier de Provence, Lettre* X, 12; Biauzat, II, 107–8; *La révolution française*, XXIII, 528; *Journal des états-généraux*, I, 65, 66; *Revue de la révolution*, XII, *Documents inédits*, 55, 56.

[6] *Ibid.*

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as quickly as possible. A scheme should be devised for the most expeditious verification of credentials, and he proposed that the delegations, of which there were 172, of the three orders of all the *bailliages* should be called; that the deputations that were present should, as they were called, pass to the dean's desk and deposit there their credentials for registration; this done the credentials should be distributed among the twenty bureaus for examination, and that the results of this examination should be reported to the general assembly. This plan was well received and adopted in all its details.[1]

The commons waited all day for the deputies of the other two orders. During the day, it was proposed to have the roll called at once, some members being impatient to begin the verification of credentials; but the dean promised that it should begin promptly at seven o'clock in the evening.[2] At five o'clock commissioners of the nobility appeared and reported that the invitation was being considered, but that no decision could be reached until the following session.[3] The commons did not expect compliance from this order. The clergy sent no reply at all.

Now that the assembly of the third estate was on the point of constituting itself, before the roll-call began, it was decided that a *procès-verbal* should be kept of sessions.[4] Heretofore the minutes of the assembly had not been kept by secretaries; the dean's assistants had taken a few notes.[5] An official record of the assembly meant, it was thought, organization, and organization at this time meant three separate assemblies. But now that the commons had decided to form themselves into an active assembly and to do this independently of the other orders, if their invitation should not be heeded, an official record was necessary. This *procès-verbal* should be kept by secretaries and signed by them and the dean. Bailly was again chosen temporary dean and

[1] *Récit,* 116, 117; *Courrier de Provence, Lettre* X, 12–24; Bailly, I, 138. Bailly says that this deputy from Paris was M. Sieyès.

[2] *Récit,* 117.

[3] *Ibid.,* 118; *La révolution française,* XXIII, 528.

[4] From this point on, my main source is the *Procès-verbal* instead of the *Récit,* which includes only the period from May 5 to June 12, 1789.

[5] As a result, we have the *Récit.* See *Bibliography.*

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Camus and Pison du Galland temporary secretaries. They were to serve until the constituting process was completed and then they were to be superseded by regularly elected officers.[1]

It was in the early evening of June 12 that the roll-call began.[2] As the secretaries read the names of the deputations of the *provinces, diocèses, bailliages, sénéchausées*, and cities in alphabetical order, following the printed list, beginning with the sénéchausée of Agen, the deputations, one after the other, advanced to the desk, and the first deputy of each delegation presented the credentials.[3] After an all-day's session, the assembly adjourned[4] to meet at nine o'clock the following morning.[5]

During the continuation of the roll-call on June 13, an incident occurred which gladdened the hearts of all the commons. Three deputies of the clergy, *curés* from Poitou, entered the hall.[6] One of them, M. Jallet, described the scene as follows:[7] "We were agreeably surprised to find the assembly so numerous, the colonnades, the galleries, all the standing room, were absolutely filled. On our arrival we were greeted with general applause, not only by the spectators, but also by the deputies of the commons. . . . The enthusiasm was very great. . . . The applause was renewed" when Lecesve, one of the *curés*, presented their cre-

[1] *Procès-verbal*, I, 2; *Journal des états-généraux*, I, 73; Duquesnoy, I, 87; Biauzat, II, 108.

[2] *Procès-verbal*, I, 3. Seven o'clock. Boullé says that it was six o'clock; *Revue de la révolution*, XII, *Documents inédits*, 57; Duquesnoy, I, 87–88; Biauzat, II, 108; *La révolution française*, 528.

[3] The sénéchaussée d'Agen may serve to show the manner of the roll-call: "MM. du clergé, nul ne s'est présenté. MM. de la noblesse, nul ne s'est présenté. MM. des communes, se sont présentés MM. François et Renault, et ont remis leurs pouvoirs." *Procès-verbal*, I, 3; *Revue de la révolution*, XII, *Documents inédits*, 57; Biauzat, II, 108, 109.

[4] *Procès-verbal*, I, 19: "A neuf heures du soir;" Duquesnoy (I, 88) says ten o'clock; *La révolution française*, 528, says that the assembly adjourned at half past ten to eight o'clock the following morning. Boullé states, *Revue de la révolution*, XII, *Documents inédits*, 57, half past nine o'clock.

[5] *Procès-verbal*, I, 19.

[6] *Ibid.*, 28; Duquesnoy, I, 91; Biauzat, II, 109; *Revue de la révolution*, XII, *Documents inédits*, 57–58.

[7] *Journal inédit de Jallet, curé de Chérigné, député du clergé de Poitou aux état-généraux de 1789, précédé d'une notice historique par Brethé* (Fontenay-le-Comte, 1871), 86.

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dentials. "The dean, M. Bailly, having with much difficulty obtained silence, I delivered the following discourse." M. Jallet spoke in favor of common deliberation. "We come, gentlemen," he said,[1] "led by the torch of reason, urged by love for the public welfare, to unite ourselves with you, our fellow citizens and brothers. We hasten to respond to the call of our fatherland, which urges us to establish between the orders peace and good will, upon which depends the success of the states general and the safety of the state. May this course be received, by the chamber of commons, in the same spirit that is influencing us! May this course, and this spirit, be generally imitated! May this, as a result, win for us the esteem of the entire French people." This speech was again followed by loud applause.[2] An established rule prohibiting applause was on this occasion conspicuously violated. Some deputies and some spectators, especially the women, were moved to tears. A member of the commons, Biauzat, wrote: "Although I pride myself on being a rigorist, I clapped my hands with a violence which makes plain to me that the heart adds force to our undertaking. Some persons have at this moment felt the sweetness of tears."

The deputies and the partisans of the third estate had reason to be elated. A first victory had been won, the barriers between the orders broken. These three *curés* had set the example for their companions. Their hearty reception on the part of the commons was the best argument that could be found to convince the other *curés* that they would not only be safe, but that they were highly regarded, and that the best project of conciliation was that all the deputies of the three orders constitute themselves in one assembly.[3] The step found imitators, for even on the next day, June 14, six other *curés* presented themselves with their cre-

[1] *Procès-verbal,* I, 28–29; Biauzat, II, 110; *Journal des états-généraux,* I, 74, 75.

[2] Biauzat, II, 110. See also note. Duquesnoy, I, 91: "Ces curés ont été applaudis avec transport. Ces trois hommes ont surement une grande force de caractère." *Revue de la révolution,* XII, *Documents inédits,* 57, 58.

[3] Duquesnoy, I, 91; *Journal des états-généraux,* I, 75. One of the *curés* was even asked to assist in the verification of credentials.

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dentials[1] and were equally well received. One of the new comers, Dillon, spoke in behalf of all. He said that he regretted much that they had not come with their three colleagues, whose intentions they had not known. "Being convinced," he continued, "that our credentials ought to be verified by all the representatives of the nation, we come, gentlemen, in the hope of seeing at last the termination of our unhappy situation," division and inactivity. "Convinced that the union of the three orders alone can bring about the happy results which the nation awaits with the greatest impatience, we announce to you, gentlemen, that it was this most ardent desire of establishing union that brought us here." On June 15, three more *curés* presented their credentials. Two of them spoke. Marolles said:[2] "Gentlemen, since the opening of the states general, my heart has been with you. In a chamber that has remained isolated, I have fought for your interests, interests which are also ours and those of the whole nation. I come here, gentlemen, to announce this truth boldly and to give recognition by my action to the indispensable necessity of common verification of credentials in a *national assembly*. I submit my credentials to your examination. It is in this document that you will find the evidence of the right of your co-laborer to assist in the important work of the regeneration of the state; in my conduct you will find the principles and the tender affection of a brother. If my example is not followed by a great many, you will certainly allow me to return to the chamber of the clergy, where the defense of your cause will demand my presence."

Such words and such action as those of the twelve *curés* during these three days cheered and animated the commons in their forward course. They certainly inspirited the debates of June 15 and June 16 and gave additional force to the bold decrees of June 17. The news of the union of the *curés* with the deputies of the third estate spread at once among the public, and the admirable effect that was produced in favor of the commons reacted in turn upon the assembly. The decisive step, together with this

[1] *Procès-verbal*, I, 80–82; *Journal des états-généraux*, I, 83–84; Duquesnoy, I, 95; Biauzat, II, 116; *Revue de la révolution*, XII, *Documents inédits*, 110.

[2] *Procès-verbal*, I, 84, 85, 87–89; *Journal des états-généraux*, I, 87.

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partial conquest, stirred up Paris, which at once reinforced and encouraged the commons in their course of constituting themselves.[1]

The roll-call of the deputation was finished on June 13. A general request was made for all those who had been omitted to present their credentials.[2]

The credentials and the *procès-verbaux* of the various elective assemblies that had been received were distributed among the twenty bureaus. The bureaus were instructed to meet at four o'clock in the afternoon of June 13.[3] Now, since the commons had commenced to organize themselves, everyone worked with greatest speed, for by eight o'clock in the evening the bureaus announced that they were ready to report to the general assembly. The report was terminated on June 14 and the verification of credentials was thus, in a general way, achieved.[4] The commons, fearing they might be stopped in the work of organizing themselves, accepted almost all the credentials without raising the question of their validity. A committee was to be appointed, after the organization of the assembly, to examine contested credentials.[5] All the steps preliminary to organization had now been taken and the commons were ready to constitute themselves. True, with the exception of the few *curés,* the deputies of the clergy and of the nobility had not joined them and had not presented their credentials for common verification, but the commons were now in a position to apply the principle that those deputies whose credentials were verified in the general hall represented the na-

[1] Biauzat, II, 111. Young (entry of June 13) says that the three *curés* from Poitou "were received with a kind of madness of applause; and this evening at Paris nothing else is talked of." See also entries on June 14 and 15. *La révolution française,* XXIII, 529, 532–35.

[2] *Procès-verbal,* I, 38–40.

[3] *Procès-verbal,* I, 54; Duquesnoy, I, 92; Biauzat, II, 111, 112; *Revue de la révolution,* XII, *Documents inédits,* 58.

[4] Duquesnoy, I, 92: "Il n'y a qu'un petit nombre de difficultés, chacun ayant le bon esprit de sentir que ce n'est pas là le moment d'être minutieux et qu'il faut accélérer la marche." *Procès-verbal,* I, 55–83; *Revue de la révolution,* XII, *Documents inédits,* 109, 110.

[5] For the verification of credentials, see the study of M. Brette, *La vérification des pouvoirs à l'assemblée nationale,*" in *La révolution française,* XXV, 413–36, 504–26; XXVI, 26–52.

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tion and they should therefore constitute themselves as a national assembly. Biauzat proposed a resolution to this effect, not to be passed in that session, but for the purpose of allowing the members to consider the subject until the next day.[1] He suggested that the deputies whose credentials were just verified should declare themselves *"Assemblée légitime des représentants connus de la nation;* and the assembly orders that all other persons who pronounce themselves deputies, whether of the clergy, of the nobility, or of the commons, and who wish to be recognized as representatives and to obtain a seat in the assembly, must first submit their credentials for common verification."

The debate on the subject of the constitution of the assembly did not begin, however, until the following morning, June 15. It was then that Sieyès presented the second part of the plan that he had announced on June 10. It had been carefully discussed outside the assembly for at least a week, not only by the Breton deputies and their friends, but also by the other deputies of all three orders and by the general public.[2]

III

In the evening of June 15, Arthur Young wrote: "This has been a rich day, and such an one as ten years ago none could believe would ever arrive in France; a very important debate being expected on what, in our house of commons, would be termed the state of the nation. . . . At Versailles by eight in the morning, we went immediately to the hall of the states to secure good seats in the gallery; we found some deputies already there, and a pretty numerous audience collected. The room is too large; none

[1] Biauzat, II, 116.

[2] Duquesnoy, I, 98. Duquesnoy quotes an extract from the speech of Crénieres, who, as well as Mirabeau, mentions the fact that Sieyès' motion was known beforehand. See also the explanation of Sieyès at the end of his motion of June 10. *Récit,* 104; Biauzat, II, 102–3; *Journal des états-généraux,* I, 86, 87; *Revue de la révolution,* XII, *Documents inédits,* 111. The *Courrier de Provence* (*Lettre* X, 4) says that Sieyès' motion and speech made a deep impression, "particulièrement sur les députations de diverses provinces, qui avaient déjà, depuis plusieurs jours, connaissance de la motion même, et y avaient donné d'avance la plus haute et la plus entière approbation."

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but stentorian lungs or the finest, clearest voices can be heard; however, the very size of the apartment, which admits two thousand people, gave a dignity to the scene. It was, indeed, an interesting one. The spectacle of the representatives of twenty-five millions of people, just emerging from the evils of two hundred years of arbitrary power and rising to the blessings of a freer constitution, assembled with open doors under the eye of the public, was framed to call into animated feelings every latent spark, every emotion of a liberal bosom."[1]

It was again Sieyès who opened the discussion. He proposed that the assembly constitute itself as the assembly of the representatives known and verified of the French nation. While the title was somewhat ambiguous, the wording of Sieyès' speech and motion was clear and direct. In the introductory remarks, he reviewed the events which had followed the resolution of June 10.[2] The assembly had decided to constitute itself. To this end it had invited the deputies of the clergy and of the nobility to unite with them and to take part in the organization. The invitation had not been accepted. The credentials of the deputies of the commons had subsequently been verified, and it was therefore now necessary for the assembly to constitute itself as an active assembly. Sieyès laid down certain principles and drew inferences from them. He enumerated various titles, but found inconveniences in all of them. After deciding in favor of *Assemblée des représentants connus et vérifiés de la nation française,* he presented his motion, or rather series of motions:

"It has been proved by the result of the verification of credentials that this assembly is already composed of the representatives sent directly by at least ninety-six hundredths of the nation.

"Such a number of deputies must not and can not remain idle because of the absence of deputies from several *bailliages,* or from several classes of citizens; for those absent ones who have been invited to come into the national hall can not have the right to

[1] Young, 163; Biauzat, II, 120: "Remarquez qu' heureusement nous admettons 8 à 1200 ouvriers à entendre le développement de nos vues pour le bien public." Duquesnoy, I, 65–66, 101, 104; *Journal des états-généraux,* I, 86, 87.

[2] *Courrier de Provence, Lettre* II.

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prevent those who are present from exercising the whole of their powers, especially when the exercise of these powers is an imperious and pressing duty.

"Moreover, since it pertains only to those representatives whose credentials are verified to concur in and to express the national wish, and since such representatives are all in this assembly, it is furthermore indispensable to conclude that it is the business and duty of this assembly, and of this assembly alone, to interpret and to carry out the general wish of the nation. No other chamber of deputies, by mere presumption, can take away any of this power of deliberation. Lastly, between the throne and this assembly no veto, no negative power, can exist.

"The assembly declared, therefore, that the common work of the national restoration ought to, and necessarily must, be commenced without any delay by the deputies present and that they must and shall follow this work without any interruption and without any interference.

"The title, *Assemblée des représentants connus et vérifiés de la nation française,* is the only title which is appropriate for the assembly in the actual state of affairs, the only title which it wishes to adopt, inasmuch as it will never give up the hope of bringing into its midst all the deputies now absent. It will not cease to invite them, individually as well as collectively, to fulfil the obligation which is laid upon them, to take part in the holding of the states general. At whatever moment the absent deputies may present themselves during the session which is now beginning, the assembly declares in advance that it will receive them with joy and that it will urge them, after the verification of their credentials, to share with them in the great work which shall result in the regeneration of France."[1]

This motion made a great impression upon the assembly.[2] It

[1] *Procès-verbal,* I, 89; *Journal des états-généraux,* I, 88–90; *Courrier de Provence, Lettre* XI, 3–6; Duquesnoy, I, 95, 96; Biauzat, II, 116, 117; *Revue de la révolution,* XII, 111, 112. In the first paragraph of the motion, *L'assemblée deliberant après la verification des pouvoirs, reconnait* was substituted for *Il est constant par le résultat de la vérification des pouvoirs.* With this exception the first four paragraphs of the motion agree verbally with the resolution. The last or fifth paragraph is expanded somewhat.

[2] *Ibid.*

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embodied principles for which the third estate had so eagerly striven, and expressed, therefore, a natural, logical, and necessary step in advance of the previous progressive movement of the assembly. Sieyès' motions of June 10 and of June 15, linked together, formulated an important event in the movement towards the realization of the idea of popular sovereignty. They expressed the theory of the rule of the majority as against the privileges of classes; vote should be by head and not by order. Although it was the great desire of the commons to have the deputies of the clergy and of the nobility meet with them in the general assembly, yet since this object had so far not been obtained because those deputies refused to present themselves in the common hall, and since further waiting and delay was regarded as hazardous to the nation and as nullifying the performance of the duties of the deputies of the third estate, the assembly decreed that it alone would begin the work of national regeneration and restoration. First and chief of this work was the making of a constitution. By this motion, the assembly declared that it would still continue to work for the union of the three orders, but if the two orders should persist in their demand for separate assemblies, their powers should be null. The assembly alone should represent the nation; between the throne and the assembly there should be no veto power nor any right of interference; the king and the assembly should govern France. If the deputies of the clergy and of the nobility wished to exercise any power at all and take part in the work of the states general, they must come into the general assembly, the decisions of which should be controlled by the wish of the majority.

This motion proposed by Sieyès, and generally accepted by the assembly, was an arbitrary one, though from the point of view of the third estate such a resolute and even arbitrary step was necessary. By this time, urged on by opponents and partisans alike, and especially by their own patriotism, the desires of the commons had grown into imperious public demands. The states general was composed of the representatives of the three orders of France, but during these eventful days, the assembly reached such a point in the growth of its interpretation of its powers and duties, that

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it alone assumed the authority of deciding the powers and the organization of the national assembly; it decreed that instead of a states general there should be a national assembly in which the orders would be fused. And the statement that the assembly should not allow any interference in its work nor any veto power which was now directed against the deputies of the other orders, was a few days later made absolute. It was expanded so that it included the king himself. Thus the assembly considered itself as possessing the sovereign power in France. Henceforth there should not be a government by divine right of kings, but a government by divine right of the people.

Certain deputies developed in their speeches these ideas of national sovereignty which were soon after put into practice. But what was, it may well be asked, the meaning and the significance of such a lengthy discussion? At least two problems confronted the commons in this act of constituting themselves, namely to determine and set forth the powers, the principles, and the policy, which they should assume as an assembly and to discover how far public opinion would follow and support the assembly in its decrees. Sieyès answered the first question by proposing that the assembly should assume all the representative power, all the power of the states general, that the privileged classes should have no independent existence, but that they should be swallowed up in this newly created nation. In dealing with the second question the use of diplomacy was thought more expedient. The motion defined the existence and the powers of the assembly, and the title, to which the public would chiefly look, could be easily modified as the principle for which the assembly stood, namely, a national assembly, was in the eyes of the public realized. What but that hindered Sieyès from proposing the title, national assembly, which public opinion had already consecrated? This formula had repeatedly been used before, and even by the king and the ministry. Sieyès had already proposed it in the conclusion of his famous monograph, *Qu'est-ce que le tiers état?* Mirabeau had used the expression continuously both in his private and public letters and in his speeches, and other deputies had employed it in their writings. Since the opening of the states gen-

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eral various deputies had made use of it in their writings and their speeches. *Assemblée nationale* had appeared even in the king's own letter to the three orders on May 28. The conciliatory commissioners of the three orders had repeatedly used the designation in their discussions, and the commissioners of the clergy and the nobility had raised no objection to its frequent appearance in the *procès-verbal des conferences.* True, the phrase had been used in the sense of the states general, but did not the motion declare that the assembly should exercise the whole of the powers of the states general?

The title which the assembly was to adopt in constituting itself was considered a sort of written constitution for the assembly. The title ought, in the fewest words possible, to express and circumscribe the composition as well as the powers of the assembly. It was the phrase, *connus et vérifiés,* of the title, *Assemblée des représentants connus et vérifiés de la nation française,* that was the descriptive and limiting feature of this title. It was also this phrase that, from the standpoint of the assembly, did not give any independent legal existence to the deputies of the clergy and of the nobility. And since these deputies could have no separate existence as orders—the majority, the commons, had decided against it—it was thought that they would finally join the assembly and take part in the work of the states general. The union of all the deputies of the three orders in one assembly would destroy the significance of the phrase, *connus et vérifiés.* And to expunge these words would leave the title entirely synonymous with that of national assembly. Again, the credentials had been verified by the deputies of the *tiers-état,* so *nation Française* stood for the assembly of the deputies of the *tiers-état,* or, expressed in the language of Sieyès' resolution adopted on June 10, *L'assemblée des communes.* This included, of course, all the deputies of the clergy and of the nobility who had already presented or who would yet present their credentials to the assembly. And *nation française* stood for *assemblée de la nation française,* or *assemblée des députés,* or *des représentants de la nation française.* To have substituted any one of these phrases for *nation française* would have made the title different only in expression

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but not in meaning. And with the omission of the words, *connus et vérifiés,* the title would have expressed nothing more nor less than the name national assembly.

And why should the assembly accept the entire proposition of Sieyès as favorably as it did, when so many radical members were present? Why was the short, the suggestive, the well-known title, national assembly, not proposed immediately after Sieyès left the floor, and why should it be passed over as unnoticed when it was proposed after a whole day's discussion? The leaders evidently avoided it, and the great majority of the members had complete confidence in Sieyès and his tactics. For several days previous to June 15, a large number of the deputies had known of the plan of Sieyès, and they had given, in advance, their hearty support to it.[1] The projects of Sieyès were prepared before June 10, for after the reading of his motion on that day, he had referred to them. He had explained to the assembly that the question of constituting itself could only be taken up after the completion of the verification of credentials. Also the personality and popularity of Sieyès gave weight to the proposed title. He was, for the moment, the acknowledged leader of the assembly;[2] his ability and great devotion to the cause of the third estate were well known; his motion of June 10, which had so entirely met with the desires of the commons, had given him, already famous, still greater prestige. The vast majority of the deputies, including those from Brittany, favored both his motion and his title. The assembly was forced to be arbitrary in its decision. It had no legal nor customary right to constitute itself as the only assembly and to declare against the veto power of the other orders, but in taking such a resolute step, Sieyès desired to give as little

[1] *Courrier de Provence, Lettre* XI, 4; Duquesnoy, I, 98: "Si favorable à ceux à qui les motions ont été communiquées d'avance, et si cruel pour ceux qui, étrangers à tous les partis, à toutes les coalitions, ne connaissent de projets que ceux qui se forment dans cette assemblée." Duquesnoy took this extract from Crénière's speech made on June 16. *Journal des états-généraux,* I, 86–87. All the deputies awaited the moment of constituting themselves and "s'y étaient préparés, et depuis quelques jours les motions étaient déjà fortes, et ce fut à les lire que l'on employa cette séance" of June 15.

[2] Dumont, 52–54.

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affront to the other orders and to cause as little public opposition as possible. A longer title did express better the actual position of the assembly and was therefore preferable to a bolder title which would cause more antagonism. Not only the king and the court, not only the privileged classes, especially the deputies of the clergy and of the nobility, not only the public even, but the deputies of the commons themselves had to be reckoned with. Some of the deputies were still more or less timid and hesitating. It is true that most of the timid ones had been won over by the evening of June 14, but it was still a question just how steadfast they would be in action. In order to be successful, all the deputies of the assembly had to stand together and be ready for the worst consequences. Sieyès, as well as other leaders, realized the seriousness of this step. But the moral strength of the assembly had been fully tested during the sessions of June 15, 16, and 17, and the commons had been sufficiently supported by encouragements from the outside to justify it in the course that it followed.[1] The lengthy and even violent debates that arose were due not to any fundamental difference in opinion among the deputies, not to any enmity among the members, but rather to the many plans prepared beforehand. The debates showed the interest and the strength of the assembly in this question of constituting itself rather than division and weakness. The deputies had their hearts set on success, and their enthusiasm inflamed the public.

Concerning the animated debate which followed the reading of Sieyès' motion, Mirabeau wrote:[2] "The session of the fifteenth has up to the present been one of the most remarkable, both because of the gravity of the subject and for the extent of the discussion and the number of persons who have taken part." Many spoke in favor of Sieyès' motion; others presented motions and titles which they had prepared. It was thought by some that the assembly did not represent the entire nation and all its interests, and a motion was presented to constitute itself as an

[1] *La révolution française,* XXIII, 533, 534.
[2] *Courrier de Provence, Lettre* XI, 3.

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assemblée de représentants de vingt-cinq millions de Français.[1] *Le point du jour* of June 19, 1789,[2] says: "M. Barrère de Vieusac, député de Bigorre, proposed *représentants de la très-majeure partie des Français dans l'assemblée nationale,* and Chérest quotes Barrère as proposing *représentants légitimes de la majeure partie des français ou de vingt-quatre millions d'hommes dans l'assemblée nationale.*"[3]

The speech of the day was delivered by Mirabeau.[4] Arthur Young, who heard him, says: "Mons. de Mirabeau spoke without notes for near an hour, with a warmth, animation, and eloquence that entitle him to the reputation of an undoubted orator."[5] Mirabeau advocated the title, "Representatives of the French people." We learn from his journal and from his tremendous exertion during the debate that Mirabeau considered the matter of the title of the very highest importance. He began by saying that he had been afflicted for several days with a very disagreeable fever, which was attacking him at that very moment and weakened him greatly. He begged his audience, therefore, to be very quiet and attentive; their sympathy would furnish him strength during his discourse; he wished to present a number of resolutions upon which he had meditated a long time and which he had drawn up when he was not suffering as he was at present.[6] By way of introduction, he spoke of the advantages to the commons of having waited so long before constituting themselves. Time

[1] *Courrier de Provence, Lettre* XI, 7; Duquesnoy, I, 96: "Représentants de 26 millions d'hommes, idée vague, abstraite, dont le résultant serait de nous laisser ce que nous sommes et ne nous donnerait aucun droit à la législation." Biauzat, II, 117.

[2] *Le point du jour,* no. I, 1.

[3] Chérest, III, 151; Chérest, III, 148, 150, 151, 152, states that the "*Procès-verbal des séances de l'ass. nationale,* in – 4°, t. I, 3e partie, Annexes, p. 13 et suiv." contains the motions of Sieyès, Barrère, Mirabeau, and Mounier. The original octavo edition of the *Procès-verbal* has only the motion as finally carried on June 17 (I, 2–4).

[4] *Courrier de Provence, Lettre* XI, 7–30. For Mirabeau's speech and motion, see also Biauzat, II, 117; Duquesnoy, I, 96; *Journal des états-généraux,* I, 90, 91; *Revue de la révolution,* XIII, *Documents inédits,* II; Dumont, 61, 62.

[5] Young, 164.

[6] *Courrier de Provence, Lettre* XI, 7–8; *Journal des états-généraux,* I, 90–91: "M. de Mirabeau presented another plan which is perhaps more

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had been given for the spirits to calm themselves and for the friends of the public welfare to come to the support of justice and reason. The deputies had shown great moderation and courage. "However, time is gliding away, the pretensions, the usurpations of the two orders have increased; your wise moderation has been taken for weakness; one (the opposite party) has conceived the hope that ennui, anxiety, public misfortunes, constantly increased by almost unheard of circumstances, would force you to some pusillanimous or rash step. Behold, this is the moment for reassuring yourselves, and for inspiring your adversaries with discretion, with fear, I almost said, with terror, in showing from your first operations foresight and ability joined with the gentle firmness of reason."

Continuing, Mirabeau indicated how easy it was just now to take very radical resolutions, especially if urged on by a passionate speech. He flattered the assembly and reproached the upper orders.[1] The private interests of the orders were opposing the general interests. The orders wished to keep the nation divided into two classes, "oppressors and oppressed; they exert themselves to perpetuate a sham constitution according to which a single word pronounced by one hundred and fifty-one individuals can check the king and twenty-four million men;[2] a constitution according to which two orders that are neither the people nor the prince will make use of the second (the king) in order to oppress the first, of the first (the people) in order to frighten the second, and of circumstances in order to reduce everything which is not they to nothingness." But all these truths teach them "the

noble and great" than the one of Sieyès, "not more prudent and wise, however." "Il parla pendant près d'une heure; le patriotisme qui l'animait ne lui permit pas de penser à la fièvre qui le travaillait dans ce moment, ou plutôt il triompha de son mal pour ne s'occuper que des maux de la patrie. Jamais il ne parla avec tant de feu, tant d'éloquence; jamais il ne dit des vérités aussi dures, aussi énergiques à la noblesse et au clergé." See also *Lettres de Mirabeau au Major de Mauvillon,* 467.

[1] *Courrier de Provence, Lettre* XI, 9: "Vos droits sont si évidents, vos réclamations si simples, et les procédés des deux ordres si manifestement irréguliers, leurs principes tellement insoutenables, que le parallèle en serait au-dessus de l'attente publique."

[2] By one hundred and fifty-one, Mirabeau means the majority of the deputies in any one of the chambers of the clergy and of the nobility.

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necessity of wisdom and perseverance in order to arrive at a constitution which shall draw us from so deplorable a state of things, and of proportioning our emulation and our efforts to the difficulties of this enterprise, sublime, no doubt, but simple, and which demands only the cooperation of statesmen[1] and the support of their wishes; for it is to the development of reason that nature has intrusted the eternal destiny of societies; and it is reason alone which is able to make laws that are binding and durable;[2] and it is reason and law alone that can govern man in society."

Mirabeau's wise guidance is seen in this address. The assembly should advance, but towards a goal that it could reach, that could not escape it. It was forced to take a firm forward step now. All peaceful means were exhausted, the conferences were closed. "It is necessary to constitute ourselves; we all agree as to that; but how? with what powers, with what title?"[3] States general was improper "for it supposes three orders, three estates, and certainly these three orders are not here. But who will propose to us to constitute ourselves with some title synonymous after all with that of states general? I shall always ask: will you have the sanction of the king? And how can you dispense with his sanction? May the authority of the monarch be in abeyance for a moment? Is it not necessary that he should concur in your decree were it only that he should be bound thereby? And when it is denied, against all principles, that his sanction is necessary in order to make binding every act outside of this assembly, will he accord to subsequent decrees his sanction?"[4]

[1] "Lumières."

[2] *Courrier de Provence, Lettre* XI, 12. "Obligatoires et durables."

[3] *Ibid.*, 199. "Il faut nous constituer, nous en sommes tous d'accord; mais comment? Sous quelle forme, sous quelle dénomination?"

[4] *Courrier de Provence, Lettre* XI, 13: "Nous proposerait-on de nous constituer sous quelqu'autre dénomination synonime après tout de celle d'états-généraux? Je demanderai toujours: aurez-vous la sanction du roi? Et pouvez vous vous en passer? L'autorité du monarque peut-elle sommeiller un instant? Ne faut-il pas qu'il concoure à votre decret, ne fût-ce que pour en être lié? Et quand on nierait, contre tous les principes, que la sanction fût nécessaire pour rendre obligatoire tout acte extérieur de cette assemblée, accordera-t-il aux décrets subséquents une sanction dont on avoue qu'il est impossible de se passer, lorsqu'ils émaneront d'un mode de constitution qu'il ne voudra pas reconnaître?" *La révolution française*, XXIII, 533.

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This part of the speech was a criticism of the motion of Sieyès. Mirabeau continued: "Are you sure that you have the support of your constituents?" The people did not care for metaphysical discussions. They must be considered more than they had been because they were of the greatest importance. "They are the development and the consequence of the principle of national representation, the basis of every constitution." The people did not care for a system of rights and theory of liberty, but they wanted relief from present oppressions. The people in time would demand more, but it was necessary for the assembly to adapt itself to circumstances. The assembly needed for its support the irresistible power of public opinion, public confidence, the unlimited devotion of the people. But public opinion was unstable, it was very easy to persuade it to sell the constitution for bread. "We are all here," he said, "under the form of convocation which the king has given us. Without doubt you can and ought to change it, when you become an active assembly; but can you do it today? Can you do it before being constituted? Can you do it in the act of constituting yourselves? By what right do you today pass the limits of your instructions? Are you not called as estates? Has the provisional legislator not supposed three orders, although he has called them in one single assembly? Your mandates, your *cahiers,* do they authorize you to declare yourselves *assemblée des seuls représentants connus et vérifiés!* And you can not say that the case in which you find yourselves has not been foreseen. It has been only too clearly, for some of your mandates instructed you to withdraw, if it should be impossible to arrive at a deliberation in common, but there is not one which authorized you to call yourselves *les seuls représentants connus et vérifiés.*

"And if you do run aground, if the king refuses you his sanction, if the two orders protest, if you are without his authority, what then? Dissolution or prorogation. . . The evident consequence of which will be the unbridling of all the vengeances, the coalition of all the aristocracies, and hideous anarchy which always leads to despotism. You will have pillages, you will have massacres; and you will not even have the execrable honor of a civil war." Sieyès' title was unintelligible and not dignified and

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would need to be changed after the union of the orders. "Do not take a title which frightens. Choose one which no one can contest with you, which, more agreeable, and not less imposing in its plenitude, is suitable at all times, is susceptible of all the development which events will permit, and which may, if necessary, serve as a lever, as it were, which will assist in establishing the national rights and principles.

"Such is, in my opinion, the following formula: *Représentants du peuple français.*"

No one could dispute this title with them and it was capable of the greatest development. The other orders would be forced to adhere to it. If they should refuse, "we will pronounce default against them, and then all the world will be able to judge between us." But to constitute the assembly, to give to it a title, was not enough. "It is necessary to establish our principles; the rational and intelligent principles, which up to the present have directed us. . . It is necessary to show why and how we are going to enter upon our active career;" that the orders were the cause of division, that the orders had no veto, no right to take separate resolutions from that of the assembly. "It is necessary to announce our intentions and our views; it is necessary to assure, by a course equally wise, legal, and progressive, the soundness of our measures, to maintain the resources of the government, in so far as they may be made to serve the national welfare, and to present to the creditors of the state the hope of this security which they desire, which the national honor requires us to offer to them, which is the great and first object of our convocation and of our wishes.

"It is to this end that have been drawn up the resolutions which I shall have the honor to read to you." After an introduction in which he presented a resumé of the events since June 10, Mirabeau read eight resolutions.[1] In these resolutions the words, *national assembly,* occurred again and again. The national assembly convoked by the king was composed of the deputies of the three orders; the deputies, of whatever order they were, had an individual and common right to sit together in the national as-

[1] *Courrier de Provence, Lettre* XI, 15.

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sembly. After the refusal of the upper orders to meet with them, those deputies whose credentials had been verified on June 13 and 14 should declare that the other deputies could receive legal authority only by presenting their credentials to the national assembly and by their confirmation in the national assembly. The deputies whose credentials were verified were authorized to organize and constitute themselves, "and they do so by the present resolution, with the powers and the title of *assemblée des représentants du peuple de France;* they enter at once into activity as such and proceed consequently to the election of a president and other necessary officers. . . . Resolved that by constituting themselves as an active assembly and with the powers of *assemblée des représentants du peuple de France,* the assembly does not intend to put any obstacles in the way of the much-desired union of the other deputies with the *représentants du peuple dans l'assemblée national.*"[1] "Resolved that the *assemblée des représentants du peuple de France* will occupy itself, without any relaxation and with all the speed of which it is capable, with plans in order to aid the great and noble efforts of the king and to satisfy the expectation of his people for the welfare of the kingdom, by communicating directly to his majesty various measures which he shall esteem most proper to fill this end; but it shall never recognize in the deputies of the privileged classes, no matter how many there are, any veto, that is, any right of opposition by separate deliberation taken outside of the national assembly to anything that shall be judged necessary for the general well-being of France."

"Whereas any taxes, that is to say, any levy of funds for the public needs, under whatever form or name the levy may be established, may not legally exist without the express consent of the people by its representatives in the states general and only

[1] *Courrier de Provence, Lettre* XI. Resolution four reads: "Résolu qu'en se constituant en la forme et qualité d'assemblée des représentants du peuple de France, l'assemblée n'entend point mettre d'obstacles à la réunion si désirée des autres députés avec les représentants du peuple dans l'assemblée nationale, qu'elle sera toujours prête à les recevoir aussi-tôt qu'ils témoigneront le desir de se joindre à eux dans l'unique qualité que leur assigne la raison et l'interêt national, et de se faire légalement reconnître en l'assemblée nationale, par la vérification de leurs pouvoirs."

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for such time as they shall judge it proper; whereas, again, this principle, sacred in every constitution in which the people is counted for something, has been acknowledged even by his majesty himself, by the sovereign courts, and by the unanimous wish of the people, as one of the essential bases of the monarchy; and whereas, finally, not one of the existing taxes is legal, either because of its origin or because of its extension since its origin, the *assemblée des représentants du peuple* declares them all null and legally suppressed." The people had not given their consent to the taxes, but since the public credit had to be maintained, since money was needed, and since it would take time to establish a new order of things, "the assembly consents, provisionally, in the name of its constituents," to the existing taxes; but they should be legally collected only during the time of that session of the states general.[1]

"Resolved that as soon as the principles, according to which the regeneration of the kingdom shall be effected, are legally determined and established, the rights of the people assured, the basis of a rational and satisfactory constitution laid down and established and secured by the protection of the legislative power of the king and of the national assembly, the *représentants du peuple de France* will take all the necessary steps toward securing the creditors of the state; that the debt of the king, which will then become that of the nation, may have henceforth for security even the honor and trust of this nation and the surveillance of its representatives, the organ and depository of the sacred treasure of public credit."

The eighth resolution provided that the above resolutions, together with an address expressing the motives for the measures taken since the former address,[2] be presented to the king. Mirabeau then continued: "You have heard, gentlemen, the series of

[1] One of the main motives in calling the states general was to establish order in the finances. This resolution was therefore an important one. It expressed an innovation. It is referred to by the deputies who informed their constituents in regard to the doings of the assembly. We shall see that although Mirabeau's title was rejected his resolutions were in substance adopted on June 17. Biauzat, II, 117; Duquesnoy, I, 96; Young, 164.

[2] *Procès-verbal,* I, 41–48. The address of June 13.

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resolutions by which I think it necessary to support the title under which I propose to you to constitute our assembly." He made a final plea for his title and showed its advantages over that of Sieyès.

Mirabeau's speech was listened to with sustained attention.[1] It was well heard all over the hall and was much applauded. A little later, however, it was violently attacked.

Another motion of which record has been made was that of Mounier. He proposed that the assembly constitute itself as an *assemblée légitime des représentants de la majeure partie de la nation, agissant en l'absence de la mineure partie.*[2] Mounier opposed the other titles as being dangerous and inexact. He supported in his turn several of the principles laid down by Sieyès and Mirabeau. His motion at first gained some favor; Barnave was one of the principal supporters of it.[3] He "defended this motion with much art, much ingenuity, in trying to show that it was conciliatory and similar to that of the Abbé Sieyès. He *combatted ingeniously the title of représentants du peuple.*"

Rabaut de Saint-Etienne favored Mirabeau's title, "*assemblée des représentants du peuple de France.*"[4] His motion contains such expressions as the assembly "ought to be one because the nation is one"; consequently "all the operations and measures of the assembly, both preliminary and subsequent ones, ought to be one also"; all the "deputies have an interest and a right to know one another"; "no one ought to be considered deputy of a bailliage, of a sénéchaussée, of a city, nor of a particular class of the French people." Only those whose credentials were verified in common were deputies. In a series of resolutions which he pre-

[1] *Courrier de Provence, Lettre* XI, 30; Young, 164.

[2] *Courrier de Provence, Lettre* XI, 31–32; *Journal des états-généraux,* I, 91–92. Both give the motion in the same words. Young, 164, says, "the legitimate representatives of the majority of the nation." Biauzat, II, 117, says that a fourth motion was made, "tendante à nous faire déclarer représentants de la plus grande partie de la nation." He thinks this motion was made by Le Meunier (Demeunier). He ascribes to Mounier the title, "Représentants de la nation."

[3] *Ibid.; Oeuvres de Barnave,* I, p. XLI.

[4] *Journal des états-généraux,* I, 92–95; *Courrier de Provence, Lettre* XI,

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sented and in which the above ideas are embodied, separate verification of credentials and separate assemblies of deputies were declared invalid and the measures of the assembly of the representatives of the French people made subject to the king's veto power only. In five further resolutions which he wished passed as decrees, Rabaut proposed that the assembly "declare all the existing taxes suppressed" for they had been established without the consent of the nation; "it creates them anew," however, only for the period of the present session of the states general. In case the present states general be dissolved without having freely consented to the taxes, "the taxes shall remain suppressed." The resolutions promised that as soon as the assembly should be properly constituted provision should be made for the national debt; that a loan should be made to provide for the current expenses of the state; that the present decision be taken to the king, that the motives of the action of the assembly be explained to him, and that he be asked for his sanction. He advised further that Necker be asked to make an estimate of the financial needs of the government. Young says that all propositions "were well approved, except the loan, which was not at all to the feeling of the assembly."[1] Biauzat states that Rabaut explained that he understood by this word (*peuple*) all Frenchmen, with the exception of the nobility and of the clergy. M. de Mirabeau, on the contrary, claims to comprehend in this word (*peuple*) all the French in general.[2]

Biauzat developed his motion of the day before.[3] According to him, Treilhard proposed that in order to deliberate prudently

[1] Young, 165; *Journal des états-généraux*, I, 95–96; Duquesnoy, I, 97: "Rabaut de Saint-Etienne, en adoptant la motion de Mirabeau, n'a pas rougi de voter un emprunt." Many cahiers had contained instructions that no taxes or loans should be voted until after the constitution had been put into practice.

[2] Biauzat, II, 117; *Journal des états-généraux*, I, 95.

[3] Biauzat, II, 117: "Etant à mon tour de parler, car nous sommes appelés sur le rôle fait à mesure des demandes de la parole, j'ai développé ma motion d'hier." Thus far the order of the principal speakers at least may be ascertained. But after the motion of Rabaut de Saint-Etienne the order can not be established with the sources of information at my command. Gaultier de Biauzat states that he himself was followed by Mounier who presented a sixth motion, while our other sources place Mounier immediately after Mirabeau.

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in every important matter, an interval of twenty-four hours should intervene between the motion and the discussion, and preparatory observations should be first listened to in the bureaus.[1] And according to the *Journal des états-généraux,* Tronchet read an article from the *cahiers* of Paris in support of his demand for two considerations of every really important question before its adoption.[2] The object of such demands as these was always either to postpone action altogether or else to give every member an opportunity to speak upon all motions after each reading and thus prevent the assembly from passing any precipitous or dangerous measures.

Judging from the order of the speakers, so far as it may be determined, it seems that this speech closed the morning session. But there was another session in the evening of June 15 in which the discussion was continued. More than thirty persons spoke during the sessions of June 15 on the various motions.[3] Young says: "More than once today there were more than one hundred members on their legs at a time, and Mon. Bailly absolutely without power to keep order."[4] Because of this confusion, an imperfect and incomplete account was kept. There occurred a great deal of repetition in the debates; men's minds tired of keeping a record.[5]

During the evening session both Mirabeau and Sieyès spoke again. Each developed his motion, each attempted to explain away the objections made to it and to show the fallacies of the

[1] Biauzat, II, 117: "M. Treilhard, avocat au parlement."

[2] I, 96.

[3] *Courrier de Provence, Lettre* XI, 33: "Le débat de ces trois motions (the motions of Mirabeau, Sieyès and Mounier), attaquées ou défendues par plus de trente personnes, dans le premier jour, a prouvé que notre nation, quoique si long-temps étrangère aux délibérations publiques, est très-capable de saisir ce genre particulier, qui ne permet ni la précision de l'écrivain, ni la loquacité du barreau."

[4] Young, 165, 166. Young continues: "This arises very much from complex motions being admitted; to move a declaration relative to their title, to their powers, to taxes, to a loan, etc., etc., all in one proposition, appears to English ears preposterous."

[5] While we have a rather satisfactory account of the discussion of the morning's session held on June 15, the record of the evening session and the two sessions of the following day is very imperfect. Men either tired taking notes or few new ideas were presented.

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other motions.[1] Target spoke also: "It is certainly necessary to constitute ourselves, but when? Today. In what manner? As Sieyès has explained. The word *peuple* does not answer to our idea. Does it signify the commons? Then it says not enough. Does it signify the entire nation? That is too much. Choose a mean which, placed between the two extremes, will neither compromise our rights nor our principles.[2] We are the known representatives of the nation."[3] Chapelier spoke also and again showed his boldness. He proposed that the phrase *connus et vérifiés* be dropped and that the title presented by Sieyès be changed to *représentants de la nation française légalement vérifiés.* This change indicated a step in advance; it brought Sieyès' title nearer the goal, national assembly. "This amendment was supported by several members and generally approved" by the assembly.[4]

Bergasse favored the motion of Sieyès, but accepted Chapelier's recommended change in the title.[5] He explained the purpose of Sieyès in inserting *connus et vérifiés,* viz., "in order to calm our fears, also to inform the other two orders that, in taking the title which is proposed to us, we do not pretend to deprive them in any way of the power of representatives of the nation, and that we wish only to remain faithful to our principles, to the system which we have adopted in the common verification of credentials, the system which permits us to recognize as deputies of the nation only those who shall have consented to have their credentials verified in common with us." Bergasse thought that such fears were not well founded and that, therefore, the phrase *connus et vérifiés* was not necessary. The title *assemblée des communes,* even the title *représentants du peuple,* was not a proper one.

[1] Biauzat, II, 118; Duquesnoy, I, 97; *Journal des états-généraux,* I, 103; *Courrier de Provence, Lettre* XI, 37, note.

[2] Biauzat, II, 118; *Journal des états-généraux,* I, 98, 99; Duquesnoy, I, 97.

[3] *Journal des états-généraux,* I, 98, 99. Target emphasizes the importance of the question under discussion: "Il faut décider avec prudence, mais avec célérité; et ce n'est qu'avec effroi que j'arrive à la discussion."

[4] *Journal des états-généraux,* I, 102.

[5] *Journal des états-généraux,* I, 100–2; Duquesnoy, I, 97. The *Archives parlementaires,* VIII, 114–18, claims to possess the entire speech of Bergasse. The extracts given in the *Journal des états-généraux* agree with it.

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True, the deputies of the assembly were elected by the commons or the people and they had also to deal with this class very largely in their business as an assembly, but they were instructed by their constituents to prepare a constitution, and they had to take into consideration, therefore, all the interests of the nation, and Bergasse maintained that the most fitting title for such an assembly was *assemblée des représentants de la nation.* "Elected by the nation in order to organize the political system of the nation, your assembly can not constitute itself otherwise than as *assemblée des représentants de la nation.*" Bergasse said that the objection found to this title was that it would wound the privileged classes and that it would end in alienating them, when the assembly had announced that it would never give up the hope of the union of all the deputies elected to the states general. "I answer, first, that even though such consideration were well founded, yet the principles which I have just developed are not less true, and when the making of a constitution is in question, it is not determined by considerations, but it is based upon principles.

"In the second place, I answer that it is wrong for you to fear that you wound the deputies of the privileged classes. They certainly agree with you in principle; surely no one but a deputy of the nation can work in the interest of the nation; they certainly agree with you, for if they would consider themselves only as deputies of the clergy, or only as deputies of the nobility, they would have no right to occupy themselves with the totality of the interests of the nation, for example with the making of the constitution."[1]

Bergasse proposed another amendment to the motion of Sieyès, namely: that as soon as the *assemblée des représentants de la nation* was constituted, a committee ought to be appointed for the purpose of setting forth the motives of the assembly in constituting itself in the manner that it had, and also of showing the necessity of vote by head, and the indivisibility of the states general. This statement should be presented to the king and should be made public.[2]

[1] Bergasse, like the other principal speakers, repeated some of the ideas expressed by Chapelier in his motion of May 14.

[2] *Archives parlementaires,* VIII, 118; *Journal des états-généraux,* I, 101, 102.

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Thouret favored Mounier's motion and spoke against the titles presented by Mirabeau and by Sieyès.[1] He said that if *peuple* stood for *plebs* the title admitted distinction of orders, but if for *populus,* "you increase the rights and the claims of the commons too much." He maintained that "it is necessary to constitute ourselves in such a manner that, when the clergy and the nobility have united with us, change in the constitution will be found unnecessary."[2]

"M. Malouet expressed himself with much force. He maintained with sound arguments that the assembly could take no other title than that of *représentants du peuple.*"[3] In supporting Mirabeau's title, Malouet made use of some of Mirabeau's arguments.[4] He said: "I adhere to the proposition which proclaims us exactly what we are, *représentants de la majeure partie de la nation,* or *représentants du peuple.* . . To constitute ourselves a national assembly without reference to the clergy and to the nobility, will cause a disastrous schism which will produce the dissolution of the states general." The assembly should never recognize the separation of the orders, nor their pretensions of possessing a veto power. He favored, also, the proposal that an

[1] *Journal des états-généraux,* I, 103. Biauzat (II, 118) states that the speech of Thouret influenced him to withdraw his motion. *Courrier de Provence, Lettre* XI, 36, 46, 47.

[2] After the union of the three orders, the phrase *représentants de la majeure partie de la nation* would certainly be no more applicable than the titles proposed by Sieyès and Mirabeau.

[3] *Courrier de Provence, Lettre* XI, 32–34. The motion of Malouet is given in a note on page 215. His speech as given in the *Moniteur* (I, 76–78) is found in the *Point du jour,* introductory volume, 384–90. The *Journal des états-généraux,* I, 104, 105, does not reproduce the speech or motion. It says that the deputies did not listen to his reading and Biauzat states (II, 118) that he was interrupted several times. The *Courrier de Provence* and the *Moniteur* do not agree.

[4] The speech of Malouet shows that he was a man of great ability. He was yet young and very ambitious. His forwardness and his readiness to take part in the discussions had made him many enemies. His seat had been contested. He was thought by some deputies to be in league with the court. He had on May 15 advised that, in order to persuade the deputies of the clergy and of the nobility to common verification of credentials, their property and social prerogatives should be guaranteed and that common verification should not prejudice the question of a single or separate chambers. See Biauzat, II, 33, 38, 39, 48, 63, 114, 115; Duquesnoy, I, 9, 10, 12, 23, 24; *Procès-verbal,* I, 73; *Journal des états-généraux,* I, 27–29.

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address be presented to the king and to the public. The king's veto power was necessary. "May our assertion [of the right of the majority] become a law? Yesterday, today, we are still the deputies of the commons. May a simple expression of our will transform us into a national assembly? In this manner he further criticised the motion and title proposed by Sieyès, modified to *assemblée des représentants de la nation.* "What does the organization as *représentants de la nation* signify? What law authorizes it? Where is the sovereign will that has expressed this just and useful intention? Are we alone the legislative power? Are we able to supply it? Has the general will authorized you to act thus? Have your constituents instructed you to constitute yourselves in this manner? It is true, gentlemen, that you are more essentially the representatives of the nation than are the deputies of the clergy and the nobility; for the first elements of the social and political power consist in the national body which has appointed us. But instead of annihilating them [the orders] you put them into action against you, if you go beyond your powers." Sieyès' title was a direct criticism on the other orders. "This attack provokes instantly a defense, a resistance, a schism."

The eloquence and good sense of this speech did not influence the assembly. Its effect was negative; it even hurt Mirabeau's motion. Dumont says, speaking of Mirabeau's motion: "This motion, not very well understood at first, was not strongly opposed, but when Malouet, who passed for a ministerial, was seen to support it and was bringing the moderates to his way of thinking, the popular party in alarm commenced a violent attack on Mirabeau. The word *peuple,* at first thought synonymous with the word nation, was now placed in another light, as having been invented to form opposition with the nobility and clergy who were not the people and pretended to be above them. Invectives were not spared. Mirabeau was termed an aristocrat in disguise who had insidiously endeavored, by this title, to vilify the true representatives of the French nation. The tempest, increasing by degrees, seemed to burst with tenfold fury.[1] Mirabeau's mo-

[1] Dumont, 73. Mirabeau was not trusted and was often accused of being sold to the court. See especially the letters of Duquesnoy.

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tion was doomed, while that of Sieyès gained correspondingly in popularity. Young says: "All conversation on the motion of l'abbé Sieyès being accepted, yet that of Mirabeau better relished." Mirabeau's "character is a dead weight upon him."[1]

The question was not decided during the sessions of June 15. "In all probability," wrote Young, "it will be unfinished even tomorrow, as the number that will speak on it is very great."[2] At ten o'clock in the evening, the assembly adjourned to nine o'clock the following morning.[3]

The leaders of the assembly had spoken during the sessions of June 15; several of them spoke again on June 16, but on this second day, for the most part, second-rate speakers discussed the question of organization.[4] Camus favored Sieyès' motion and title as amended; he maintained that by constituting themselves as the *représentants de la nation française légalement vérifiés,* they were expressing "a simple fact, an authentic truth. You are the only verified representatives; why not publish it therefore in the face of the nation? And why speak to us of the sanction of the king, of his veto? Can his veto prevent that the fact which we shall proclaim, that the truth which we shall publish is always one and always unchangeable? Can his veto prevent us from

[1] Young, 168.

[2] *Ibid.,* 166.

[3] *Procès-verbal,* I, 96; *Journal des états-généraux,* I, 106, states, "Il était près de onze heures." Biauzat wrote (II, 118) at nine o'clock the next morning: "L'assemblée n'a pas encore commencé, j'ai entrevu, dans les différentes groupes qui raisonnent en attendant, que la motion de M. l'abbé Sieyès passera, et sans restriction. Les Bretons, les Dauphinois, les Angevins et leurs adhérents, qui font capable depuis près d'un mois sur toute matière, épaulent ce système qui pourrait bien n'être pas généralement approuvé hors de chez nous. Cependant faudrat-il bien se référer à la majorité des voix, que l'on recueillera infailliblement dans aujourd'hui." *Courrier de Provence, Lettre* XI, 36: "L'assemblée ne se separa qu'à dix heures et s'ajourna le [au] lendemain à huit." *Revue de la révolution,* XII, *Documents inédits,* 112: "Les discussions . . . se sont prolongées jusqu'à environ onze heures."

[4] *Courrier de Provence, Lettre* XI, 36, 37: "Moins de nouveauté dans les discours des opinants de cette séance, et par conséquent moins de complaisance attentive dans l'assemblée." For the two sessions held on June 16 we have an account by Hardy, printed in *La révolution française,* XVI, 536–39. A study of the speeches delivered before June 15 and of the committees appointed by the commons shows that the deputies who spoke on June 15 were the chief men of the assembly.

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being what we are and what we must be? Can the royal sanction change the order of things, alter their nature? We are the *représentants vérifiés de la nation,* the king can not change us to something which we are not; he can force us not to exercise the rights which this title gives us, but is it not necessary that this title should extricate us?" Camus, in these words, practically expressed the sovereignty of the people or of the commons. The assembly could and should constitute itself in such a manner and with such powers as it saw fit. He also severely criticised Rabaut's proposition of making a loan.[1]

Crénières proposed that the assembly should constitute itself as *représentants de nos commettants.* He, as several others had done, advised that a certain time should elapse between the proposal of a project and the voting on it. The custom of voting at once upon important matters he thought unsatisfactory: "This custom, so convenient for those who speak, so painful for those who think, so favorable for those to whom the motions have been communicated in advance, and so cruel for those who, strangers to all parties, to all conspiracies, know only those projects which are forming in the assembly."[2]

Régnier and Prugnon supported Mounier's motion. The latter wanted to substitute for the phrase *en l'absence de la minorité,* the expression *en attendant la minorité.*[3] Both Sieyès and Mirabeau rose in support of their motions and attempted to refute the objections made to them.[4] Le Grand, a deputy from Berry, made a new motion.[5] It was he who first proposed during these de-

[1] Duquesnoy, I, 98; *Courrier de Provence, Lettre* XI, 36; *Journal des états-généraux,* I, 107–9.

[2] Duquesnoy, I, 98; Biauzat, II, 119.

[3] Duquesnoy (I, 98, 99) quotes Prugnon: "Les pontifes élèvent les autels de la religion contre les autels de la patrie; ils ont consigné l'esprit public à la porte de leur salle, pour l'empêcher d'entrer. Les droits de la noblesse sont anciens, les nôtres sont éternels; les siens se perdent dans la nuit des temps, les nôtres remontent jusqu'à l'origine des sociétés. Si la justice cessait d'être sur le trône, elle se réfugierait dans les communes. Les abus sont comme ces tours antiques qu'on ne peut détruire qu'on ôtant pierre par pierre et qu'il faut quelquefois laisser au temps le soin de démolir." *Journal des états-généraux,* I, 110; Biauzat, II, 119.

[4] *Courrier de Provence, Lettre* XI, 37; Biauzat, II, 119.

[5] *Courrier de Provence, Lettre* XI, 34–36; Biauzat, II, 119; *Journal des*

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bates the title, *national assembly*. The two privileged classes, he asserted, were a part, but only a small part, of the nation; they were in the nation, but they could not have a separate existence as chambers; the deputies had to come to the general assembly if they wanted to take part in the national business. The motion declared for the indivisibility of the national assembly and against interference in its deliberations by any right of veto. This motion was overlooked; the hearers were tired and waiting for the midday rest. Pison du Galland made another motion similar to that of Le Grand. He proposed that the assembly constitute itself as a national assembly.[1] These speakers were followed by various deputies who for the most part favored Sieyès' motion.[2] According to Duquesnoy,[3] a Lorrain proposed the title, national assembly. "All the speakers who followed appeared to adopt this advice, with the exception of Mounier, who delivered a long discourse in order to bring his motion again into favor."[4]

At about two o'clock, the assembly adjourned to five that same afternoon.[5] Almost the whole evening session was taken up, either directly or indirectly, with the question of constituting the assembly.[6] Mirabeau spoke in favor of his title and in opposition to the other titles. He had been angered by the reception of the word *peuple*. He knew the great superiority of his title, yet, because of his unpopularity and the great popularity of Sieyès, it was rejected. The assembly was led by men and not by ideas. He disliked Sieyès, according to Dumont, because he did not flatter him.[7] He feared a revolution and saw the assem-

états-généraux, I, 111, 112; *Procès-verbal*, I, 98: "La discussion commencée hier a été reprise. Il a été proposé une nouvelle motion à l'assemblée sur la forme de sa constitution." This must have reference to the motion of either Le Grand or of Pison du Galland.

[1] *Courrier de Provence, Lettre* XI, 34, 54, 55; Biauzat, II, 119.

[2] Biauzat, II, 119; Duquesnoy, I, 99. Andrieu, Robespierre, Durand, de Maillane, Girot de Pouzols, Roussillon de Toulouse, Regnaud, Rewbell, Bouchotte.

[3] Duquesnoy, I, 99. Possibly Duquesnoy himself.

[4] Duquesnoy, I, 100. According to Biauzat (II, 120) and the *Journal des états-généraux* (I, 116), Mounier spoke in the evening session.

[5] *Procès-verbal*, I, 99–104; *Journal des états-généraux*, I, 113.

[6] *Journal des états-généraux*, I, 113, 114.

[7] Dumont, 70: "Il était peu content de Sieyès et des Bretons, qui ne le flattaient point."

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bly becoming more and more radical and presumptuous. "Assembly of the French people" was an unassuming title and could not cause any great antagonism and opposition. According to Dumont,[1] Duroverai[2] and Dumont helped him to prepare a speech that showed the strength of his title and motion and the weakness of the others. It was difficult for Mirabeau to obtain the floor, "but the galleries were so fond of listening to him that the assembly durst not persist in a refusal."[3]

Mirabeau expressed his surprise that, after he had repeatedly formulated his views in favor of the indivisibility of the states general, especially in the series of resolutions in which he had asserted the rights and the dignity of the people, he had been accused of wanting the isolation of the orders.[4] "I speak here the language of liberty and I take for a foundation the example of the English and the Americans, who revere the word people."[5] He did not attempt to degrade the people. In regard to the royal sanction, he said: "And I, gentlemen, I believe the veto of the king so necessary that I should much more prefer to live at Constantinople than in France without it. Yes, I proclaim it, I know nothing more terrible than the sovereign authority of six hundred persons, who, tomorrow, would provide for their life-long tenure, the day after tomorrow make themselves hereditary, and finish, like the aristocrats of all the countries of the world, in making themselves absolute."

Mirabeau then made a comparison of his motion with those of Sieyès and Mounier.[6] He showed their similarities and dissimi-

[1] Dumont, 74.

[2] A Genevese; a friend to the popular cause in France. Both Dumont and Duroverai aided Mirabeau in the editing of his paper and the writing of his speeches.

[3] Dumont, 74; *Journal des états-généraux*, I, 115; *La révolution française*, XVI, 537.

[4] In the *Courrier de Provence* (*Lettre* XI, 37–54), Mirabeau wrote: "L'auteur de la seconde motion reprit la parole à son tour, et l'on trouvera dans son discours la substance de toutes les objections, de toutes les difficultés qui avaient été faites jusqu'à ce moment. En un mot, on peut considérer ce discours comme un précis de la délibération entière." *Journal des états-généraux*, I, 115–19.

[5] *Courrier de Provence*, I, 219. The elder Pitt used the expression, majesty of the people; the United States, the natural rights of the people.

[6] Both Sieyès and Mounier had spoken at least three times and this was

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larities, and the advantages to the deputies of constituting themselves the *représentants du peuple.* The three motions agreed on the four cardinal points: the necessity of constituting promptly an active assembly; "the declaration that our assembly is not and may not be the states general"; the advantage of another title, under which the assembly might be constituted; the necessity of preventing any vote by chambers, any schism of the national assembly, any veto of the privileged orders. And Mirabeau's motion was more emphatic upon this last point than were the other motions. But what, he questioned, was the difference? What justified the deputies in being so violent in the debates? "Why is it that my motion, so clearly based upon principles which put it above every criticism, so explicit, so satisfactory for every man that detests, as I do, every kind of aristocracy, why should this motion be pictured as so inapplicable, so little worthy of an assembly of friends, of servants of this people which has charged us to defend it?" The other titles were too lengthy and were unintelligible to their constituents. *Connus* and *vérifiés* had no significance; these words did not distinguish the assembly from the other orders. The title and motion of Sieyès did not agree; a logical conclusion of the motion would be to constitute themselves as a national assembly, as states general. The title of Sieyès was based upon arguments and not upon positive law; "mine rests upon a fact, an authentic, undeniable fact, which is that we are the *représentants du peuple français.*". The title of Sieyès is weak, for "the deputies of the clergy and the nobility may decide to come into our hall for the purpose of verifying their credentials, and return afterward into their respective chambers in order to vote there by order." This action would destroy the significance of Sieyès' title. Not so with the title of Mirabeau himself, for it would apply equally well after the union of the orders.

After defending his title against all criticism, he delivered a peroration "in a ringing voice."[1] He said: "I persevere in my

Mirabeau's third speech. *Courrier de Provence, Lettre* XI, 37; *Lettres de Mirabeau au major de Mauvillon,* 467; Biauzat, II, 120; Duquesnoy, I, 100.

[1] *Courrier de Provence, Lettre* XI, 37. Dumont, 74: Dumont wrote (74): "L'exorde que j'avais fait concilia passablement l'attention; la partie argu-

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motion and in the only expression which has called forth so much criticism, I mean the phrase, *peuple français.* I adopt it, I defend it, I herald it abroad for the very reason that has been urged against it. Yes, it is because the word *peuple* is not enough respected in France, that it is made obscure, covered with the rust of prejudice; because it presents an idea alarming to our pride and revolting to our vanity; because it is pronounced with contempt in the chambers of the aristocrats. It is for these very reasons that I wish it; it is for these very reasons that we ought to assume it, not only to elevate, but to enoble the name and render it thus henceforth respectable to ministers and dear to every heart. If this title were not already ours, it should be selected from among all others, and we should insist upon its adoption as the most precious method of serving that people, which is everything, from whom we derive our authority, that people whose representatives we are, whose rights we defend, and yet the assumption of whose name and title seems to raise the blush of shame on our cheeks. Ah! how I should exult, if by the choice of such a title, firmness and courage were restored to the down-trodden people! My mind is elevated by the contemplation of futurity, of the happy results which may proceed from the use, the adoption, of this name! The people will look up to us, and we will look up to the people; and our title will remind us of our duties and our strength. Under the shelter of a name which neither startles nor causes alarm, we can sow and cultivate the seeds of liberty. . . Representatives of the people! vouchsafe to answer me! Will you go and tell your constituents that you have rejected this name of people? That if you are not ashamed of them, yet you have endeavored to elude this name as appearing not a sufficiently flattering title? That you wanted a more fastidious title than that which they could confer upon you? Gentlemen, do you not perceive that the title of *représentants du*

mentative passa entre des applaudissements et des murmures; mais cette péroraison, qu'il prononça d'une voix tonnante, et qu'il fit écouter par une sorte de terreur, de quel effet elle fut suivie! Ce ne furent pas des cris, mais des convulsions de rage; l'agitation fut générale, une tempête d'injures fondit de toutes parts sur l'orateur, qui restait immobile et debout."

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peuple is absolutely necessary, inasmuch as it will insure to you the attachment of the people, that imposing mass, without which you would be nothing but single individuals, nothing but slender reeds which might easily be broken one by one? Do you not see that you require the word people, because it informs the people that you have united your fate to theirs, because it will teach them to center in you all their thoughts and all their hopes?"

Especially the last part of this oration aroused great animosity in the assembly.[1] "It was succeeded, not by cries, but by convulsions of rage."[2] Many deputies interpreted Mirabeau's words as intended to intimidate and lord it over the assembly. The commons had become strong in working against difficulties and they would not tolerate any restriction whatever of their independence. Some of them believed Mirabeau wished to discredit their body by raising either the people against it or, if his title were accepted, the upper classes. It is in this connection that Biauzat remarks that from eight hundred to twelve hundred day-laborers attended the sessions,[3] and Duquesnoy, that Mirabeau was a rascal and sold to the court.[4] The majority of the deputies had no political training and, not having suffered from the abuses of an absolute form of government as Mirabeau had, they could not understand this attitude towards this question of constituting the assembly. They could not appreciate his conception of the significance of the word people. If his title, *representatives of the French people,* had been adopted as generally as was that of Sieyès, *national assembly*, we are inclined to believe that the cause of popular sovereignty would have received a greater impulse towards wholesome development than it did by the passing of the declaration of the rights of man even. The meaning of the word people was, as Mirabeau said, subject to the very broadest interpretation. His own conception of it was perhaps very similar to

[1] *Courrier de Provence, Lettre* XI, 53, 54; *Journal des états-généraux,* I, 119; Biauzat, II, 120; Duquesnoy, I, 100; Dumont, 75–77; *La révolution française,* XVI, 537, 538.

[2] Dumont, 74–75.

[3] Biauzat, II, 120.

[4] Duquesnoy, I, 100–1; Young, 168, writes June 17: "There is a suspicion that he [Mirabeau] has received 100,000 livres from the queen."

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our own use of it, that is, as including every individual of the whole nation. We can therefore, at present, better appreciate his truly wonderful effort in behalf of his title than did most of his colleagues. We do not mean to say that no egotistic motives prompted Mirabeau in his action. Well might a man aspire, under such circumstances, to give a name to such an assembly, and also to overcome a rival like Sieyès and a combination such as the Breton deputies and their friends. However, Mirabeau's heart was in the cause. His personality was much broader and richer than that of Sieyès, who withdrew from the scene of action as soon as his ambition was checked and his person perhaps in some danger. The deputies hissed and shouted with rage at the speaker, but "in the midst of this agitated and uproarious assembly, M. de Mirabeau continued his discourse; he was no longer heard. When he had finished, he raised his voice, shouting, 'If this part of my discourse is reprehensible, I am willing to take the blame and suffer the consequences. I leave it on the desk, signed by my own hand.' "[1] It appears that shortly afterwards he withdrew the manuscript and then left the hall.[2] We must not say that he departed just because he was angry with the assembly. He wrote, perhaps the same day, to a friend that he was bathed in perspiration during his speeches, because of fever. "I have spoken three times, while suffering from a chill."[3] In his next *Lettre à ses commettants,* Mirabeau partly excused himself: "The word *peuple,* often repeated, has been taken for an appeal to the conscience of the deputies, as if it had been necessary to call them back to popular sentiments. It is not astonishing that those among them who understood him in this strange way were offended. But it is singular that anybody could deceive himself for the moment and suppose in the speaker a thought which was so far from his heart, and which could enter there less than ever on the day on which was discussed with so much zeal the honor of the assembly and the welfare of the nation. Convinced that it would suffice to read

[1] *Journal des états-généraux,* I, 119.
[2] *La révolution française,* XVI, 538.
[3] *Lettres de Mirabeau au major de Mauvillon,* 467.

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in a calmer mood this which he had said in order to remove all accusations so poorly founded, he contented himself with the apology of leaving the manuscript of his discourse upon the bureau and of signing it with his own hand."[1]

Mirabeau's speech, being understood as it was, had stirred the assembly to its very depths. It was thought that, as the discussion continued, the agitation would become greater and possibly result in a division among the commons. The deputies wanted to act at once before graver obstacles could present themselves. The assembly wished to constitute itself in order to act as a unit against all combinations formed in opposition to it. Deputies had also been frightened by rumors of a royal session in which, it was said, the king would dictate his wishes and settle the dispute between the orders. The court, the higher clergy, and the nobility were thought to be in league with each other, and even a delay over night seemed to many deputies hazardous to the interests of the nation and of the assembly. These deputies demanded immediate action and called loudly for the question.[2]

It was with great difficulty that Le Grand, Pison du Galland, and Sieyès obtained the floor again and made themselves heard. Le Grand read again his motion which had received no notice in the morning session. Pison du Galland wanted the assembly to constitute itself as *assemblée légitime et active des représentants de la nation française.* This motion, well explained and tending strongly toward the idea of national assembly, was received with vigorous applause. A second reading was immediately demanded.[3] Sieyès, under pretext of defending his motion, amended it. He made the motion read: "The title of *assemblée national* is the only proper name for the assembly. . ." The motion and title as amended suddenly gained favor.[4] But certain individuals delayed the vote. They asserted that the amendment

[1] *Courrier de Provence, Lettre* XI, 53–54.

[2] *Journal des états-généraux,* I, 119; Biauzat, II, 120.

[3] *Journal des états-généraux,* I, 119; *Courrier de Provence, Lettre* XI, 54–55.

[4] *Journal des états-généraux,* I, 120; *Revue de la révolution,* XIII, *Documents inédits,* 12; *Courrier de Provence, Lettre* XI, 55; Duquesnoy, I, 101. The last paragraph of Sieyès' motion as adopted on June 17 was entirely revised. *Procès-verbal,* I, 2–4.

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to Sieyès' motion made it a new motion and therefore subject to new discussion and further clarification. But they were unsuccessful; the assembly decided in favor of putting the motion. It was now nearly midnight and many deputies had left the hall and gone to their lodgings. It was, therefore, urged that the assembly ought to adjourn to the next morning. The agitation became most violent.[1] The majority of the deputies promenaded the hall shouting either "aux voix, aux voix!" or "à demain, à demain!" or demanding further discussion of Sieyès' new motion.[2] Bailly, at this time president, wrote later: "The session of this evening was one of the most important and critical moments of my life," and "this day presented to me the image of two armies ready for attack."[3] A large number labored under the impression that it was dangerous for the commons to wait, that preparations were made for the defeat of their plans, that the delay over night might destroy all the advantages they had obtained and counteract all the progress they had made up to this night. And there was truth in this belief, as will be shown later, but even illusions appear often grave realities, especially in the mind of excitable Frenchmen.[4]

But the assembly was finally restored to its equilibrium. A member loudly summoned "all good citizens" to be seated. About four hundred followed the advice, while about eighty still remained standing. This minority was then invited by some spectators to leave the hall and not to interfere with the action of the majority. This demand started a new commotion. The counter-demand, on the part of one of the eighty that the visitors ought to depart instead, was greeted with shouts of "you are traitors, bad citizens, leave the hall!" It seems that most of the minority actually did leave. Then a deputy, Biauzat perhaps, called at-

[1] *Revue de la révolution,* XIII, *Documents inédits,* 12; *Journal des états-généraux,* I, 120; Duquesnoy (I, 101) says that 494 deputies voted against further discussion and 80 in favor of it. The *Courrier de Provence* (*Lettre* XI, 56) says that 99 voted in favor of renewed discussion. *Procès-verbal,* I, 104.

[2] Duquesnoy, I, 101; *Revue de la révolution,* XIII, *Documents inédits,* 12–13.

[3] Bailly, I, 150, 153.

[4] *Revue de la révolution,* XIII, *Documents inédits,* 12–13.

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tention to the lateness of the hour. He observed that a great many deputies had gone home, that the members of the clergy who had joined were not there, that those still present were very tired, and that the roll-call would consume some time. He strongly urged that the session be adjourned to the next morning. In fact, such an important decision as the one under consideration ought to be taken in broad daylight when all the members were present and wide awake. It was an injustice to the absent members to act without their cooperation, and if there were bad citizens among the minority, they would be discovered if they were present and voted against the measure. This plan was adopted with the proviso that the debate be closed and that the roll be called immediately after the opening of the next session.[1]

IV

In his *Journal,* under the date of June 17, 1789, Bailly wrote: "This day is forever memorable. It is that of the constitution of the assembly; it is that in which the assembly announced the rights of the nation and in which it showed, for the first time, the resolute and wise capacity which is fitting to the representatives of the nation and to the administrators of its authority."[2]

The session was opened with the announcement by Bailly that the assembly would at once proceed to vote upon the various motions that had been presented on the previous days.[3] All further discussion was thus prevented, according to the midnight decision of the assembly. The preference of the deputies in regard to the propositions was known and was further made evident by the entrance of Sieyès. According to Dumont, "When Sieyès appeared in the hall, all the members, from a spontaneous feeling of respect, rose to receive him, and thunderous applause resounded from every side."[4]

[1] Duquesnoy, I, 101–2; *Journal des états-généraux,* I, 120–21; Biauzat, II, 122; *Revue de la révolution,* XIII, *Documents inédits,* 12–13.

[2] Bailly, I, 156.

[3] *Procès-verbal,* no. I, 1.

[4] Dumont, 78.

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The dean ordered the reading of five motions and announced that a majority vote was absolutely necessary for the adoption of any one proposition.[1] The motion of Sieyès as amended was read first. It was carried by a large majority. Out of the 583 votes cast, 491 favored it, 90 opposed it, and 2 were not counted.[2] During the voting there was a most profound silence in the hall, but when the vote was announced a wave of enthusiasm swept over the assembly. The deputies and spectators alike repeatedly burst out into most enthusiastic cheers and shouts of: "Vive le roi! Vive l'assemblée nationale!"[3] And they had good reason to be elated at this first great victory. It seemed to them that the die had been cast and that the fundamental questions requisite to any decisive financial reforms were solved. In their enthusiasm they for the moment lost sight of all future difficulties.

Sieyès' motion of constitution as finally amended thus passed into a resolution or decree, was signed by Bailly, as dean, and by the two secretaries. Some members had, on the previous evening, demanded that all the deputies of the assembly should sign their names to it. It was held, however, that the effect would be weakened thereby instead of strengthened. The list would not only be incomplete because of the absence of the deputies of the clergy and of the nobles, but it would even show a division in the constituted assembly itself. And the national assembly acted immediately on the principle that it embodied all the deputies of the states general.[4]

The national assembly then voted that an address be prepared which, together with the decree, should be presented to the king. In this address the loyalty to the king should be expressed and the reasons which prompted the deputies in constituting themselves the national assembly should be given. The deputies in-

[1] *Procès-verbal,* no. I, 3.

[2] *Courrier de Provence, Lettre* XI, 57; Duquesnoy, I, 105; *Revue de la révolution,* XIII, *Documents inédits,* 13–14; *La révolution française,* XXIII, 534–35; *Le point du jour,* I, no. I, 3; Biauzat (II, 122) says 492 votes favored it and 89 opposed it.

[3] Duquesnoy, I, 105; *Revue de la révolution,* XIII, *Documents inédits,* 13–15; *Le point du jour,* no. I, 3; Rabaut de Saint-Etienne, *Précis,* 124–26.

[4] *Procès-verbal,* no. I, 1, 2; Duquesnoy, I, 105; *Courrier de Provence, Lettre* XI, 56–57.

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deed were filled with the greatest patriotism; they loved their country and their king as the nation's chief representative. Many of them, no doubt, went even so far in their imagination as to think that the king was with them and that the victory over the privileged classes was already won; they could not control their emotions therefore, and again and again they burst out into cries of "Vive le roi!"[1] It was a beautiful dream that filled the working hours of the deputies of the third estate. To them, they believed, had fallen the magnificent task of becoming the benefactors of twenty-five millions of Frenchmen, of setting the nation in the straight road towards perfection and of making France the model and the savior of the world.

Not all the deputies were, however, happy. The great statesman, the keen observer, Mirabeau, took matters more philosophically. Referring to his colaborers, he, in the presence of a friend, exclaimed: "What a pity! Do they imagine that all is over? I should not be surprised if civil war were the fruit of their pretty decree."[2] He was no doubt thinking of the difficulties that confronted the national assembly. He knew that these deputies who had no experience whatever in statesmanship had a task almost superhuman before them in the regeneration and reconstitution of France. In this work of the national assembly, the king, the court, the privileged classes, the nation, the national assembly itself had to be taken into consideration. The question might well be asked by a man like Mirabeau whether the social and political conditions of France could be properly adjusted to the ideas of the deputies of the third estate, constituting either alone the national assembly or the majority party in the national assembly. The failure of the national assembly to bring about the necessary reforms meant, as Mirabeau said in his speeches of June 15 and June 16, revolution, anarchy, despotism. June 17 marked a great crisis in the French revolution, but it was only

[1] *Procès-verbal*, no. I, 4–5: " . . . la salle a retenti des cris multipliés de vive le roi."

[2] Dumont, 78: "Quelle pitié! me dit Mirabeau; ils s'imaginent donc que tout est fini; mais je ne serais pas surpris si la guerre civile était le fruit de leur beau décret."

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the first of a series of crises. Madame de Staël says of the constitution of the third estate that "it was the revolution itself."[1]

Since the deputies had now formed themselves into an active assembly, Bailly requested the election of regular officers. But time was thought precious; other business was considered more urgent. Bailly, who was, up to this time, called dean, was continued as president, and Camus and Pison du Galland as secretaries.[2]

The next step on the program was a very impressive one. The president and secretaries took an oath to fulfil their functions faithfully. The president next administered the oath to the assembly. To the deputies, standing with uplifted right hands and profoundly silent, the president repeated the following formula: *"Nous jurons et promettons de remplir avec zèle et fidélité les fonctions dont nous sommes chargés."* The assembly solemnly responded: *"Nous le jurons et promettons."* "This imposing and truly religious act" was followed by an outburst of applause.[3]

There had been much discussion as to the wording of the formula. Bailly had proposed the expression: *"Nous jurons tous à Dieu, au roi, à la patrie de remplir avec zèle et fidélité la mission que nous avons reçue."*[4] But it is clear that the assembly did not wish to commit itself to the king, even on this day of good feeling. While the deputies at one time practically lost themselves in enthusiasm and expressions of admiration for the king, shortly afterward they formulated an oath, to which they swore in the most solemn manner, that could not be more formal, less emotional, more non-committal, more general. They swore to no one, they promised nothing to anybody but to France itself. They vowed to perform the functions with which they were charged.

[1] Staël, I, 164; Chérest, III, 144.

[2] *Procès-verbal,* no. I, 5, 9–10. *Courrier de Provence, Lettre* XII, 4; Biauzat, II, 122; Duquesnoy, I, 105; *Revue de la révolution,* XIII, *Documents inédits,* 14.

[3] *Procès-verbal,* no. I, 10; *Courrier de Provence, Lettre* XI, 57; Biauzat, II, 122–23; Duquesnoy, I, 105–6; *Revue de la révolution,* XIII, *Documents inédits,* 14.

[4] Duquesnoy (I, 105) wrote: "Cette formule noble, grande, paraissait devoir être adoptée; cependant, sans qu'on puisse dire pourquoi, on a préféré la suivante . . ." Biauzat, II, 123; *Le point du jour,* no. I, 4.

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The decree that they had just passed announced that, "It pertains to the national assembly alone to interpret and to present the general wishes of the nation." The national assembly could assume, therefore, according to these expressions, all the powers that it wished; it could constitute France, it could legislate for France.

Thus constituted and ready for the great work before it, the assembly sought at once to fortify itself by declaring its policy and its powers. The advice of Mirabeau, as presented in his resolution on June 15, that to constitute the assembly was not sufficient—its principles should also be announced—was now followed. Up to this time, the public had looked upon the disputes, the inactivity of the states general with wonder and doubt. France had been left in suspense as to the outcome of all the agitation between the orders. A new order of things had been expected, a regeneration of France had been looked for, but these expectations had not been realized. It was now the business of the assembly to calm the public and to make it realize that the reforms for which it had so long striven would be secured. The national assembly, therefore, decided to make a general statement of its policy, and in this way present something tangible around which public opinion could form. The support of the public was necessary in order to successfully conquer the deputies of the clergy and of the nobility.

To this end, the national assembly declared that taxes could be legally voted only by the representatives of the nation; that since the existing taxes had not received this consent they were illegal, consequently null and void in their creation, extension, and prolongation. But the assembly "declares, by a unanimous vote, that it consents provisionally, in the name of the nation, that the taxes,[1] although illegally imposed and collected, continue to be raised in the same manner as they have been heretofore, but only up to the time of the separation of this assembly, no matter from what cause the separation may proceed. After the day of separation, *l'assemblée nationale entend et décrète*[2] that every levy of taxes[3]

[1] "*Impôts et contributions.*"
[2] Orders and decrees.
[3] "*Impôts et contributions.*"

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of whatever nature, which shall not have been particularly, formally, and freely granted by the assembly, shall cease entirely in all the provinces of the kingdom, no matter what may be the form of their administration."[1]

The purpose of the deputies in this decree may be easily seen. The national assembly provided for non-interference in its business. Heretofore the government had repeatedly interfered with parliaments and states general; it had even dissolved them. But this assembly was considered by its members as a different body. It was a national assembly and as such possessed and expressed the highest authority of the state, the sovereignty of France. The government was to be, thenceforth, at the mercy of the national assembly. It could not exist without an income. The time when a government and armies could live from plunder had passed; the nation was ready to regulate its own affairs. If the government should undertake to interfere with the business of the assembly or even to dissolve the assembly, it would henceforth meet with difficulties which it would not be able to overcome. After the national assembly had declared so strongly that its mission was to work for the good of France, its existence was secured. Its decrees would be followed by the public, and if it were dissolved, the government, in order to exist, would be forced to call at once another national assembly. The people in their instructions to the deputies had expressed their wishes, they had claimed their rights and made their demands, and if they should be assembled for another election, they would be still more exacting. The deputies knew that the government would bear all these considerations in mind and that the government of Louis XVI. was wretchedly weak.

This decree was truly revolutionary. The national assembly spoke as a sovereign; the king's power was no longer absolute; the constituent assembly had begun its work in limiting the monarchy; the idea of the divine right of kings had been rejected and popular and national sovereignty had been declared.

[1] *Procès-verbal,* no. I, 10–14. Le Chapelier and Target prepared this decree. Biauzat, II, 123, 124; *Courrier de Provence, Lettre* XII, 1–4; Duquesnoy, I, 106; *Le point du jour,* no. I, 5.

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The assembly believed itself strong enough to put this new doctrine into practice, for the decree stated further: "The assembly hastens to declare that as soon as it shall have fixed, in concert with his majesty, the principles of the national regeneration, it will occupy itself with the examination and with the consolidation of the public debt, putting the creditors of the state from this time on under the protection, the fidelity, and loyalty of the French nation.

"Having at last begun its work, the assembly recognizes also that it owes its first efforts to the examination of the causes which produce in the provinces of the kingdom the poverty which oppresses the people and also to the investigation and development of plans which may remedy the situation in the most prompt and efficacious manner. Consequently, it has decided to name a committee which is to occupy itself with this important object. . . The present resolution will be printed and distributed in all the provinces."

It was thus, on June 17, 1789, that the commons took the first revolutionary step by declaring themselves the national assembly. The assumptions of the sovereignty of the people, of the right of the majority to rule, and of the negation of the political independence of the clergy and of the nobility were all involved in this act that marked the beginning of a new era for France.

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The principal sources of information upon the history of the sessions of the three orders of the states general and of the conferences of the commissioners are the minutes, letters of the deputies, and newspapers. Gaultier de Biauzat wrote, as early as May 22, 1789, that there were more than a hundred men in the assembly of the third estate who took notes. These notes were taken for personal reasons as well as for use in the preparation of the accounts sent by some of the deputies to their friends and constituents. A part of this most valuable literature was published during the last generation. A large bulk of it still lies buried in private and provincial archives. Some of the *procès-verbaux* and newspapers are more or less easily accessible. I have studied critically most of the material used in the preparation of this monograph and have published the results in an article entitled *The Fourth of August, 1789,* which appeared in the *University Studies* of the University of Nebraska (vol. VI, no. 4, October, 1906). The reader is referred to this publication for the study of the sources. I shall enumerate here only the material used for this monograph. Where, however, the material gives information on the period covered by the present work and has not been discussed in the previous publication, critical notes have been added.

Journal d'Adrien Duquesnoy, député du tiers-état de Bar le-Duc, sur l'assemblée constituante. 3 mai 1789 — 3 avril 1790. Publié pour la société d'histoire contemporaine, par Robert de Crévecoeur. 2 vols. Paris, 1894.

Mège, Francisque: *Gaultier de Biauzat, député du tiers-état aux états-généraux de 1789. Sa vie et sa correspondance.* 2 vols. Paris, 1890.

Albert Macé has published in the *Documents inédits* of the *Revue de la révolution* a number of letters of Jean-Pierre Boullé. The letters were written to his constituents of the *tiers-état* of the *sénéchaussée de Ploërmel* and addressed to the municipal officers of Pontivy. Those published cover the period from May 1 to October 30, 1789. They are found in volumes X, 161–71; XI,

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11–20, 45–53, 113–20; XII, 7–14, 35–42, 49–58, 109–12; XIII, 11–17, 65–79; XIV, 26–32, 42–51, 82–92, 114–23; XV, 13–28, 99–120; XVI, 15–29, 45–84. In the political correspondence of the time, these letters of Boullé rank very high.

In vol. II, *Documents inédits*, 1–8, 33–41, 65–74, 97–104, and 139–43, B. d'Agours publishes the *Correspondance d'une député de la noblesse de la sénéchaussée de Marseille avec la marquise de Créquy, à Blaincourt, par Brienne, Champagne (13 mai—8 août 1789)*. These letters are of special value because the writer, unlike the others who favored the third estate, sympathized with the privileged classes. On June 18, he says: "The states general are going to the devil. . . . This assembly of the third estate degenerates into extravagances," and on June 26: "The states general goes from bad to worse."

M. A. Brette has published a *"Relation des événements depuis le 6 mai jusqu'au 15 juillet 1789"* in *La révolution française, revue d'histoire moderne et contemporaine, publiée par la société de l'histoire de la révolution.* Vols. XXIII, 348–68, 443–71, and 520–47, and XXIV, 69–84 and 162–78. It is the work of a "secret agent," who spent part of his time in Paris and part in Versailles. He followed the various incidents connected with the sessions of the three orders very closely, even when at Paris, and tried to observe especially their influence upon public opinion. The name of the writer is not known, but he appears to be a person of some importance. His bulletins seem to be very valuable. M. Ch.-L. Chassin has printed extracts from these bulletins in his collection of source-material: *Les élections et les cahiers de Paris en 1789.* 4 vols. Paris, 1888–89. Vol. III, 415–23, 453–60, 465–68, 490, 544–45.

Messieurs Corre and Delourmel have published in the same review, vols. XXXIX, 515–58, and XL, 46–78, extracts from the letters of L.-F. Legendre, deputy of the *tiers-état* of the *sénéchaussée de Brest.* The correspondence covers the period from April 28, 1789, to December 30, 1791. Unfortunately, for the period covered by our present study, the extracts given are few and brief.

In vol. XVI, 536–39, M. H. Monin publishes the account of

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the two sessions of the *tiers-état* held on June 16, 1789, given by Hardy in his journal. Hardy was present at the meetings.

M. Ch. Le Téo has, in vol. XXXVI, 385–95, an article entitled *Le club breton et les origines du club des Jacobins* in which he gives short extracts from the correspondence of deputies.

Récit des séances des députés des communes, depuis le 5 mai, 1789, jusqu'au 12 juin suivant, époque à laquelle le rédaction des procès-verbaux a commencé. 172 pp.[1] On December 10, 1789, the national assembly appointed three commissioners, Salomon, Camus, and Emmery, to draw up this account. They did so and signed their names to it. Camus was on June 12 chosen secretary, and he and the other two men were repeatedly chosen for secretary purposes. Camus was even made superintendent of the newly created archives. These men either used their own notes or employed notes of other deputies. Camus presided over the electoral assembly of Paris for the last time on May 22, and was present at Versailles only after that date. We have observed that Gaultier de Biauzat wrote on May 22 that over a hundred men took notes. On May 11 a motion was made that the dean's assistants keep notes, and on May 20 that a *comité de rédaction* be chosen to draw up an account of the sessions and edit it in order to be sent to the people. It is seen, therefore, that the deputies were conscious of the importance of taking notes from the very first, and that it must have been a comparatively easy task to prepare the *Récit.* Some *curés* kept journals and the nobles kept *procés-verbaux* of their sessions. M. A. Brette enumerates this material in the *Avertissement* of his volume, *Les Constituants* (Paris, 1897), and M. Maurice Tourneux in the first volume of his *Bibliographie de l'histoire de Paris pendant la révolution française,* Paris, 1890, p. 78.

Courrier de Provence by Mirabeau, preceded by his two numbers of *Etats-généraux* and nineteen *Lettres du comte de Mirabeau à ses commettants,* three hundred and fifty numbers, 17 vols., in 8°, appeared between May 4, 1789, and September 30, 1791.

Journal des états-généraux by Le Hodey de Saultchevreuil. I

[1] I have used M. Aulard's edition of the *Récit* published in 1895 by the Société de l'histoire de la révolution française.

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have called this journal *Assemblée nationale* in my former study, because that was actually its title from June 17, 1789, to January 5, 1791, when *ou journal logographique* was added; by this name it is clearly distinguished from all other journals. *Journal des états-généraux* is only the cover title for some of the sets.[1] No number was ever issued with the title *Journal des états-généraux.* Four numbers, covering pp. 1–32, 33–62, 63–78, 79–102, appeared before June 17, 1789, and they have the title *Etats.* The first of these contains an account of the sessions of June 1 to June 6. According to the editors (II, 70), it was during the first part of June that the journal was started. In the same connection, in the number which has a partial account of the session of July 18, they say that the next day an account of the sessions held during the month of May would be issued. This narrative of eighty pages bears the title *Etats-généraux,* evidently in contradistinction to the title *Assemblée nationale,* which it had after June 17.

Le point du jour, ou résultat de ce qui s'est passé la veille à l'Assemblée Nationale. 815 numbers. June 19, 1789, to October 2 or 3, 1791. 27 vols., in 8°. Paris, chez Cussac. Barère, the editor of this journal, issued in 1790 a volume entitled *Le point du jour, ou résultat de ce qui s'est passé aux états-généraux, depuis le 27 avril 1789, jour annoncé pour leur ouverture, jusqu'au 17 juin de la même année, époque où les communes se sont constituées en assemblée nationale;* par M. D.***, député extraordinaire. Paris, Cussac, 1790. *Discours préliminaire* XXXV, 415 pp. This volume is for the most part a compilation of extracts taken from other sources. Much of the material is found in the *Lettres de Mirabeau à ses commettants,* and the *Procès-verbal des conférences sur la vérification des pouvoirs* (216 pp.) is, for example, bodily incorporated. In places, however, the names of speakers are inserted instead of "a deputy of the com-

[1] 35 vols in 8°, 1789–92. The copies in the libraries of the *Archives nationales,* Paris, listed as AD$^{A}/_{300}$, of the British Museum, London, listed as F. 1524^{6}+, and of President White at the Cornell University library, Ithaca, New York, listed as 4182 V b 1–35, have the cover title *Journal des états-généraux.* The set in the *Bibliothèque nationale,* Paris, listed as Lc$^{2}/_{120}$, has the book title *Logographe.*

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mons" or "a deputy of the nobles." If this work is used at all it must be carefully compared with the strictly original source-material. It makes such mistakes, for example, as to place the solemn procession to the church St. Louis and the services held there on May 5 instead of May 4, and the opening session of the states general on May 6 instead of May 5. Similar errors are found throughout the whole volume.

Gazette nationale, ou *Le moniteur universel.*[1] There is in the Cornell University library a complete set of the original edition of the *Moniteur* extending from January 1, 1790, to December 31, 1867, and there is another set of the original edition of the *Moniteur* in the President White library of the Cornell University library, which covers the period from November 24, 1789, to December 30, 1794. This set is a duplicate, therefore, of the numbers between January 1, 1790, and December 30, 1794. And the thirty-eight numbers from November 24 to December 31, 1789, if taken with the other set, entirely complete the set. We mention the fact that the original thirty-eight numbers of 1789 and the thirty-three numbers from January 1 to February 2, 1790, and even two copies of the thirty-three numbers, are here because they are very rare.[2] There is here also the original introductory volume to the *Moniteur* prepared in 1795–96. It contains the *Introduction historique,* the ninety-three compiled numbers covering the period from May 5 to November 23, and the thirty-eight revised numbers (numbers 93–131) for the period between November 24 and December 31, 1789, and the *Pièces justificatives.*[3]

Buchez, B. J. B., et Roux, P. C.: *Histoire parlementaire de la révolution française, ou journal des assemblées nationales depuis 1789 jusqu'en 1815.* 40 vols. Paris, 1834–38. The *Histoire*

[1] The edition of Gallois: *Réimpression de l'ancien moniteur depuis la réunion des états-généraux jusqu'au consulat (Mai 1789—November 1799), avec des notes par M. Leonard Gallois* (31 vols., Paris, 1840–47), is more generally accessible than the original folio edition.

[2] Tourneux says in his *Bibliographie,* II, pp. 556 and 789, that he knows of only four sets of these numbers.

[3] I have described this volume in *The Fourth of August, 1789,* pp. 16–39. I am inclined to think that if the editors of the *Moniteur* actually carried out the plan they announced in their paper of October 30, 1795, of printing

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parlementaire draws its material for the sessions of the three orders from the *Moniteur*. It has for our subject, therefore, not the slightest value.[1]

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Aulard, F. A.: *La société des jacobins. Recueil de documents pour l'histoire du club des jacobins de Paris.* 6 vols. Paris, 1889–97.

Procès-verbal des séances des députes des communes, depuis le 12 juin 1789 jusqu'au 17 juin, jour de la constitution en assemblée nationale. 104 pp.

Procès-verbal de l'assemblée nationale. 75 vols., in 8°. Paris, 1789–91. Baudouin. These two sources belong together. The second is a continuation of the first and dates from June 17, 1789. The first is commonly bound in with the first volume of the second. The *Procès-verbaux* consist of minutes taken and material arranged by the secretaries of the assembly. They are of the greatest value because they were read to the assembly from session to session for the sake of accuracy. For our period Camus and Pison du Galand were the secretaries.[2]

Procès-verbal des conférences sur la vérification des pouvoirs. 216 pp. Target, one of the commissioners of the *tiers-état,* prepared the larger part of the work. On June 4, Hébert was chosen official secretary (p. 153). The Marquis de Bouthillier objected (p. 171), on the part of the nobles, to the draft of Target on the ground that the arguments of the commissioners of the third

two volumes, that in the second volume the original numbers covering the period from January 1 to July 1, 1790, were simply reprinted.

[1] See my study, *The Moniteur and Other Sources, Graduate Bulletin,* the University of Nebraska, March, 1902, 17–18. The *Histoire parlementaire,* I, 384–474, omits entirely the accounts of the sessions of the third estate on May 8, 9, 11, 14, 16, 20, 22, 25, and June 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, and of the conferences of the commissioners. Almost all of the sessions of the clergy and of the nobles are left similarly unmentioned. The compilers wished to abridge the *Moniteur,* and so they omitted either the accounts of whole sessions or reproduced them only in part by omitting paragraphs. Not only is very important material left out and relatively unimportant matter given, but the context is thus destroyed. The substance of the accounts omitted is seldom given and then only by brief paragraphs.

[2] See my *Fourth of August, 1789,* 1–5, 24–26.

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estate were reproduced at greater length and to better advantage than those of the commissioners of the nobles. We sustain Bouthillier's objection and note that allowance must be made for this defect; otherwise this work is of the greatest value.

Young, Arthur: *Travels in France during the years 1787, 1788, 1789, with an introduction, biographical sketch, and notes by M. Betham-Edwards.* Second edition. London, 1889.

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Mémoires de Bailly, avec une notice sur sa vie, des notes et des éclaircissements historiques, par MM. Berville et Barrière. 3 vols. Paris, 1821.

Rabaut, J. P.: *Précis de l'histoire de la révolution française. Assemblée constituante, suivi de réflections politiques sur les circonstances.* Septième édition. Paris, 1819.

Dumont, Etienne: *Souvenirs sur Mirabeau et sur les deux premières assemblées législatives, ouvrage posthume, publié par M. J. L. Duval.* Bruxelles (et Leipzig), 1832. In the same year an English translation of it appeared. There are later editions of it in both French and English.

Staël, Madame de: *Considérations sur la révolution française.* 2 vols. Paris, 1862.

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Montjoye: *L'Ami du roi, des francais, de l'ordre et sur-tout de la vérité; ou histoire de la révolution de France, et de l'assemblée nationale.* Paris, 1791–92.

Droz, Joseph: *Histoire du règne de Louis XVI., pendant les années où l'on pouvait prévenir ou diriger la révolution française.* 3 vols. Paris, 1839.

Bertrand de Molleville, A. F.: *Histoire de la révolution de France, pendant les dernières années du règne de Louis XVI.* 14 vols. Paris, 1801–03.

Lameth, Alexandre: *Histoire de l'assemblée constituante.* 2 vols. Paris, 1828–29.

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Memoires du marquis de Ferrières, par MM. Berville et Barrière. 3 vols. Paris, 1821.

Histoire de la révolution française par M. Necker. 4 vols. Paris, 1821.

We have read what other memoirs and the various histories of the French revolution say on our subject. We mention in our bibliography, however, only the work of Chérest, Aimé: *La chute de l'ancien régime (1787–1789).* 3 vols. Paris, 1884–86. Vol. III deals more in particular with our subject. It contains the best account we have. Chérest used his material on the whole intelligently. He made good use of the *Récit* and the *Procès-verbaux* and the *Lettres du comte de Mirabeau à ses commettans.* But he employed altogether too much the mémoire literature, which is of questionable value, and too much material from the *Histoire parlementaire.* He preferred this work to the *Moniteur* and the *Archives parlementaires,* both of which he used at intervals, although it is vastly inferior to either of the others. Furthermore, he naturally made no use of the political correspondence of deputies which has been published since his day.

We mention finally a study by Dr. Charles Kuhlmann on the *Influence of the Breton Deputation and the Breton Club in the Revolution (April—October, 1789),* which appeared in the *University Studies,* October, 1902.

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UNIVERSITY STUDIES

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I.—*The Separation of the Spectral Lines of Thorium in the Magnetic Field*

BY B. E. MOORE

PART I. INTRODUCTION, EXPERIMENTAL METHOD, AND PECULIAR FEATURES OF THE THORIUM SPECTRUM.

The spectral photographs of this substance were taken during the winter semester of 1907 at the physical institute of the University of Göttingen at the suggestion of the director, Prof. W. Voigt, who courteously placed all the necessary equipment at my disposal and enthusiastically promoted the investigation. This was at the time I studied the spectra of barium, yttrium, zirconium, and osmium (*Univ. Studies,* Jan. 1908). The thorium lines were found to be too numerous and entangled to admit of ready identification and were therefore laid away for study at a more opportune time. A component or more of a line is frequently found between the components of another line. Two components of different lines may lie so close together that one can tell with difficulty to which of the two lines they may belong; or two or more components may overlap. These overlaps are of various degrees, i. e. in one extreme they may be merely touching each other and form one broad line; or in the other extreme be accurate duplicates in position, and produce an intensified sharp line. How complicated this becomes may be illustrated by one small region, six Aengstrom units wide, about the separation of D_1 and D_2, where there were found components of thirteen lines. These

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entanglements are usually unraveled by studying the photographs of two field intensities. Such a method I have pursued, but unfortunately the field strengths differed by only 20 per cent, where 40 per cent difference was desirable. Sometimes the overlaps are so sharp that one falls into no particular error in assuming them to be the centers of two overlapping components. But one can not regard this procedure as accurate as measurements of isolated components. Neither have I regarded the measurements upon the weaker field plates alone as accurate as the other measurements. Further, they would be less accurate than lines measured for both field strengths and in both first and second order. All the less accurate measurements have been enclosed in parentheses.

A characteristic of the thorium spectrum is that the components which vibrate perpendicular to the lines of force, the *s*-components, are usually narrower and sharper than those which vibrate parallel thereto, the *p*-components. This was helpful in isolating the *s*-components. The thorium lines with no magnetic field were usually very sharp, but there were exceptions, and these were lines which behaved peculiarly (see later). This sharpness of the no-field lines led to the following method of identifying the lines and components thereof for both kinds of vibrations—a method which saved a great amount of labor and led to some important discoveries. Each set of plates was cut in two longitudinally through the center, and the edges of the lines of either the *p*- or *s*-components brought into juxtaposition with the ends of the lines upon the no-field plates in the center of the field of view of the microscope. One-half of the field of view of the microscope had a fixed cross wire (a diamond mark on glass); and upon the other half of the field of view there was a movable system of lines in pairs of various separations. A sharp no-field line was brought under the single fixed line and the corresponding *s*- or *p*-line placed as nearly symmetrical as possible therewith, by hand adjustment, under the other cross-wire system, and the final adjustment made by a micrometer which controlled this cross-wire system. By means of another micrometer the whole microscope could be moved, and by means of this motion one

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could pass readily from one line to another coincidentally upon both sets of plates. In this way a series of readings was then taken for a number of lines in the field of view upon both sets of plates. The majority of these adjacent lines were duplicates in position within the errors of setting the microscope. This error for the *p*-components was twice as great as the corresponding error for the no-field lines. The latter also can be adjusted more accurately than the double readings of the *s*-components of a triplet.

By this method of comparison I discovered that a great many of the lines were unsymmetrical in position, assuming that the lines which could be brought into juxtaposition were symmetrical. If, however, as Professor Voigt writes me, there should be a one-sided displacement of the *p*- or *s*-components, it might be impossible to detect it, as the plates would be displaced as a whole. Such a displacement or dissymmetry is theoretically derived by Professor Voigt.[1] It involves the period of the vibrating ion and a constant which depends upon the absorption and emission of the ion. This constant would vary from ion to ion, and therefore there would be large variations from line to line, unless the lines arose from the same ion. From Geiger's[2] investigation, the displacement is only one two-thousandth part of the total separation of the D_1 line for a field strength of 2,400 lines to the square centimeter. But for the red *K*-line corresponding to D_2 Geiger's data give a ratio of 3 per cent. The latter would be observable unless the lines were diffuse. We may, then, in a great many cases expect the effect to be too small to be observable. Even if it were generaly observable in any particular substance, the great range in values would make it impossible to set the greater part of the lines in juxtaposition on the two sets of plates at the same time. Therefore, the juxtaposition of most lines indicates that the effect is too small to be observable in those cases. For the weak lines, the effect being a function of the emission, the displacement should be small, and probably smaller than I could detect. On account of the width of many of the *p*-components,

[1] *Phys. Zeit.* 9 (1908), p. 123, eq. 11.
[2] *Ann. d. Phys.* 24 (1907), p. 597.

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it would escape detection at any rate. Again, any irregular contraction of the films in drying would cause appreciable error in the measurement of very small quantities. Errors from such sources are mitigated by taking several sets of plates. Two sets of *s*- and *p*-plates were at my command, but only one set of no-field plates. When irregularities were present upon one set of plates they were also present upon the other, but the difficulty might be with the no-field plates with which they were compared.

For the purpose of detecting small variations, then, the method is not altogether free from error. But if both *s*- and *p*-components are photographed together, i. e. without the intervening calcite, neither does one then know whether the *p*-component or the *s*-components are displaced in an unsymmetrical triplet; and if the *p*-component happens to be a wide line and the *s*-components have small separations, the readings are then confusing and much less accurate than the method which I have followed. Had I anticipated the dissymmetry of lines at the time these photographs were taken, I should have desired to have photographed the *p*- and *s*-components directly upon the same plate as the no-field lines, by the long-established method of Rowland, viz., by taking two exposures upon one plate, covering one-half of the plate for the no-field exposure and the other half of the plate for either the *p*- or the *s*-exposure. Even then, it occurs to me, that the method might not be accurate enough to test dissymmetries as small as one might expect from the Voigt equation, as it also seems to me that the method is not quite accurate enough to test quadruplets and triplets for simple relationship between the magnitudes of the separations (e. g. Are these separations related to a normal "*a*", and are they multiples of aliquot parts of "*a*"?) My previously measured triplets would certainly not suggest the choice of any value as a normal, and neither would the quadruplets in the present investigation.

The question, however, does arise, Is there adequate error to allow one to collect them into groups whose separations are related to one another in a simple way? I do not think the error so large. However, it does seem to me what is wanted to answer this interesting question and the dissymmetry question as well,

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from the standpoint of Voigt's equation, is an experimental method of five times the accuracy which one may possibly obtain with some of the new forms of interferometer. Such a method was used by Gmelin (*Phys. Zeit.*, vol. 9, p. 212), who found the mercury line 5790 λ to have a dissymmetry proportional to the square of the field strength. This results from the hypothesis of linkages among the electrons (Voigt, *Phys. Zeit.*, vol. 9, p. 353). The field strength of the two sets of plates here studied differed only by 20 per cent, and were not adapted to an investigation of that point, like Gmelin's observations, whose field strength varied two and one-half fold. However, the following considerations will show that my measurements should have given me some intimation of such a change with the change in field strength. If one designates the distances of the two *s*-components from the null position by "*a*" and "*b*," the distance from the middle is $(a+b)/2$, and the deviation of the apparent middle is $(a-b)/2$. For 20 per cent greater field, on the assumption of Gmelin, the former is increased 1.2 times, and the latter $(1.2)^2$ times. The weaker of my dissymmetrical lines were measurable only upon one set of plates, but those lines which could be measured upon both sets of plates gave practically the same results when the separations of the weaker field were increased 1.2 times. It would not seem that *all* of the difference for *all* of the lines was due to experimental error. If the result is granted, it would mean that the dissymmetry is proportional to the field strength. However, greater variation in field strength would be more competent to settle the question. From the Voigt equation the above half sum is also the usual separation and the half difference the dissymmetry. The latter value is a constant, and is independent of the field strength. Now there are cases in thorium where a equals $3b$, and therefore the magnitude of the dissymmetry is b. Maintain this value of b constant and diminish the field one-half. The distance from the apparent middle is then $(a+b)/4$ which equals b. One component then falls in the null position, and only the other component is displaced. This is meaningless. And 20 per cent difference in field should have given me something different from what was observed if there

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was any constancy in the value $(a—b)/2$. Therefore, there seems some reason to assume that the dissymmetries are due to some other causes than those discussed in Voigt's equations.

Dissymmetry has also been observed by Mr. Jack (Zeeman, *Phys. Zeit.*, vol. 9, p. 343). His spectrographs were taken partly prior and partly subsequent to these thorium spectrographs and with the same apparatus. Professor Voigt writes me that Mr. Jack thinks he has traced the dissymmetry to changes in the azimuth of the polarized beam of light incident upon the grating. This is important, if true. I think two experimental facts make it implausible in thorium: firstly, a number of the observed dissymmetries are too large; secondly, before placing the plates in the camera for an exposure the quartz condensing lens was often shifted and readjusted to see that there was the best possible illumination of the grating. (But the lens was never moved during an exposure.) It does not seem probable that this lens occupied the same position throughout the thorium exposures or even the greater part of them. Consequently, any point on the grating was illuminated at different times by light in a different azimuth. If the effect had been appreciable, it would have produced inconsistencies in my measurements, which I have not observed.

In my previous investigation (*l. c.*) the *p*- and *s*-components were measured on independent plates. Small dissymmetries would have remained undiscovered. It should be said, however, that for these substances I had plates with both *p*- and *s*-components thereon, i. e. plates photographed without the intervening calcite. As I passed from line to line comparing the intensities of the *p*- and *s*-components, some of the pronounced dissymmetries herein recorded would have been glaringly conspicuous without measurements. Further, the dissymmetries are not only often large but they are found also in lines having more than three components up to and including a line of nine components. In these also may be found multiple relationships among the unsymmetrical components, which could be only a coincidence unless these dissymmetries were proportional to the field strength. Thorium was also photographed without the intervening calcite, but the

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components were too entangled and bewildering to be of any service, and the plates were not saved. This resulted in some loss in the comparison of the intensities of the *s*- and *p*-components. The relative intensities of the *s*- and *p*-exposures can therefore only be roughly approximated. To obtain an accurate basis of comparison, the *p*-intensities may need to be reduced about 25 per cent. The intensities here recorded are multiples of apparent brightness of the components in the first order spectrum, taking a line which is just sufficiently defined to be continuous latterly across the plate as unit intensity.

In the dissymmetry theory there is a dissymmetry in the intensity of the components. The component which has a smaller displacement than its companion should have greater intensity. In Mr. Jack's lines reported by Zeeman (*l. c.*) there is no such inequality recorded. In thorium the least displaced component is always the stronger. There are a few apparent exceptions, but these are invariably due to overlapping components of adjacent lines. However, there are a large number of lines which show this dissymmetry in intensity for which there was no dissymmetry in separation. Some of these, again, are plainly overlaps, but there are a great many which are not. Farther, there are cases where components are broader than their conjugate components. No accurate record could be made of this, for the effect might be slight or large. Sometimes it was the red, sometimes the blue component which was widened. It seemed possible that one might have here components of two very close lines whose separations differed but little in magnitude. The width of some of the undisturbed *p*-components sometimes suggested the same thing. But the latter might be close doublets which would separate with stronger fields. The no-field plates actually showed some of these to be two lines. A no-field line shaded to one side might suggest the presence of other lines also, but this is too common an occurrence with spectral lines to be definite. If one could omit all of these there were still lines which showed this action for sharp no-field lines. It might appear that the broadened line was going to separate into two lines with stronger field, leaving an unequal number of components on the two sides

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of the zero position. One could only answer this possibility by photographing with very strong fields. It is not implausible, because there are cases found in thorium where the number of components on the two sides of the zero position do not balance. One component of one line which is unseparated for the weaker field strength is double for the 20 per cent stronger field. That it is such a splitting is certain because the mean of the two separations is symmetrical with the separation of the opposite component.

In one small region of the spectrum (Table XIX) I found it necessary to make accurate measurements of wave-length, from line to line, to make sure of identification. I have recorded these lines as measured, although Exner's and Hascek's tables are more accurate than my measurements. However, lines are often shifted by small amounts, and these lines were peculiar in other respects (see discussion, Table XIX). Hence there might be cause for the shift, and I have, therefore, not hesitated to record them as read. There can, in general, be no question as to the identity of these lines, unless it be for lines not given in Exner's and Hascek's tables. There were many of the latter, and it may be an error to call them all thorium. Many of them possess peculiarities in common with lines which are certainly thorium in the list. There was no special effort made to find impurities, but lines due to calcium, iron, strontium, and lead are present, and none of these impurities behave peculiarly. Some of the strong lines of Exner's and Hascek's tables are omitted because of their weakness, but they are generally omitted because of the confusion due to overlapping components of other lines, leaving the components a blurred mass.

The following abbreviations have been used: *s-* and *p-* as already explained; *r*, red; *b*, blue; λ, wave-length; *d*, or diff., diffuse; *O*, order; *o*, overlap; *i*, intensity; *a*, normal separation; *A*, approximate separation; $\Delta\lambda/\lambda^2$ change in wave-frequency per cm., and therefore a positive value, means a displacement toward the blue end of the spectrum. The normal separation corresponds to a value of 1.105 for a field intensity of 24450 lines to the square cm., used in my previous contribution and checked here from the separations of the calcium lines. If the strength of field is in

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error, corrections may be made if needed when physicists are decided upon the accuracy and magnitude of these magnetic fields.

PART II. GENERAL DESCRIPTION OF THE TABULATED MEASUREMENTS

Tables I–XI inclusive contain symmetrical lines exclusive of the triplets.

Table I consists of two 14-component lines. The interior *s*-components are too weak to be very positive of their presence. The exterior *s*-components are diffuse, and not capable of measurement with desirable accuracy. The *p*-components agree very closely for the two lines. This fact, and the general appearance of the components, leads to the conclusion that they are duplicates. The separations are shown as multiples of .17, and these agree as closely as could be expected for the *p*-components. The value .17 does not appear to be an aliquot part of the normal *a*, for $a/6$ gives .184 and $a/7$, .158.

Table II contains two 12-component lines, which are evidently not related. The components of 4086.71 λ are related in a simple way. All are probably multiples of .214. This differs little from $3a/16$, which is not an aliquot part of *a*. The readings may also be represented about as well by multiples of $a/11$, which is one of Runge's aliquots of *a*. The former value gives a distance from component to component for the *s*-separations of 4 x .214, and the same value for the *p*-components. The latter, $a/11$, gives uniform spacings for the *s*-components; but for the *p*-components we have $8a/11$ once, and $9a/11$ twice for the spacings. There can be scarcely a doubt but that the components are equally spaced and that the value is the same for both *s*- and *p*-. This leads to the rejection of the aliquot interval value, $a/11$.

Table III gives two 11-component lines. They are not duplicates, but a multiple relationship holds for the components of each line. The repeated values are not rational parts of *a*.

Table IV contains two 10-component lines. They are not duplicates and a simple relationship in the components is not apparent.

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Table V has one 9-component line. The inner pair of *s*-components is $a/2$, but the other components are not related to it.

Table VI has three 8-component lines and all differ. A relationship of the components is not apparent.

Table VII contains one 7-component line.

Table VIII contains seven 6-component lines. There are no duplicates; and there are only three separations in the different lines which correspond to a or multiple aliquot parts thereof. For line 4178.2 λ the components are (4, 3, 2) times .262, with deviations respectively of +.012, —.006, and —.004, while (4, 3, 2) times $a/4$ would give deviations of —.05, —.05, and —.03 respectively. Such deviations in a set of reading are certainly exclusive.

Table IX contains seven 5-component lines and no duplicates.

Table X contains 166 quadruplets. The first row gives the *s*- and the second the *p*-components. Each separation represents both a positive and a negative value. Under intensities the first recorded refers to the red, the second to the blue component. If the components are of equal intensities only one value is recorded. In overlaps the intensity, of course, arises from the red component of one, and the blue component of the other line. There are several duplicates, but among these duplicates I have found no series. It is difficult to tell just when these lines may be duplicates. They shade off by small values toward separations which are quite different. In the triplets of yttrium and zirconium I found the values to progress by almost insensible increments from very small to very large separations, and if there were distinct types there was no separating them. The thorium quadruplets behave in the same way, particularly if one includes the unsymmetrical quadruplets. The quadruplets, however, have a *p*- as well as an *s*-separation, which gives one a double chance to isolate types. We may choose the *p*-separation equal to $a/2$ (.553) and find it represented in lines 4017.65 λ, 3730.12 λ, 3670.12 λ, 3470.08 λ, 3445.87 λ, and 3324.88 λ. The corresponding *s*-separations for these lines are respectively 1.06, 1.28, .52, 1.29, 1.07, and .83. Here are evidently two pairs. The value .83 ($=3a/4$) is the only one related to a. Similarly, if one were to

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choose lines corresponding to either of these *s*-separations, one would find the *p*-components to have as great a variety in their separations. There are a number of the *s*-separations reasonably near to the value *a*, but very few, however, of the corresponding *p*-components come near to aliquot parts of *a*. These relations suggest that there is no particular meaning to be attached to a "normal" separation among these quadruplets. None of these separations approach reasonably near to the quadruplet principal series, neither were there representatives of the companion sextuplet series. There are lines having the *s*- and other lines having the *p*-separation of the same magnitude as the quadruplet principal series, but no lines having both components coincidentally.

Table XI contains a list of sixty *p*-doublets. The intensities follow the order of Table X. The weakest of these lines do not appear upon the *s*-plates, and only upon one set of *p*-plates. On account of overlapping, it was impossible to make out the character of the separations for some *s*-components, and impossible to measure others. Some *s*-components were too diffuse to measure. It is safe to say that most of these lines are quadruplets. On account of the wide variation in the magnitude of these *p*-separations it would be no easier to arrange and classify them than a similar number of triplets. If one may add the greater portion of them to the quadruplets, they increase the already large variation of these components and make it more improbable that there is any standard in the magnitudes of these separations.

Tables XII–XVI inclusive contain a list of unsymmetrical lines exclusive of triplets.

Table XII is an unsymmetrical 9-component line. There are two red and one blue *p*-components. The latter is double the inside red component. The remaining red component has the value of the "normal" triplet, but it is not related in a simple way to the other *p*-separations, nor to the separations of the *s*-components.

Table XIII is an unsymmetrical 7-component line. Both *p*- and *s*- are unsymmetrical; but the strong undisplaced *p*-component is the only one which can be measured with desirable accuracy.

Table XIV gives four 6-component lines. The footnotes indicate their principal features.

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Table XV contains seven 5-component lines. At least six of these are unsymmetrical with respect to the *p*-component only. Line 4115.85 λ has its components in the ratio of (0, 1, 3, 4) times .417. The first three values represent the unsymmetrical *p*-components and the latter the symmetrical pair of *s*-components. In the *p*-components of 3938.86 λ one finds (0, 2, 3) times .41, which is practically the same interval as in the previous line. The *s*-components of this line are not related to this interval. However, we may combine both *p*- and *s*-components together as multiples of the interval $a/11$. We then have (0, 8, 12, 14) times $a/11$. Applying this interval to the previous lines gives larger discrepancies in the readings. In line 3709.82 λ the *s*-components are nearly in the ratio of one to two in separation and in the ratio of three to one in intensity.

Table XVI contains thirty-three quadruplets. Twenty-four of these have unsymmetrical *p*-, and fifteen unsymmetrical *s*-components. There are six of these lines "lop-sided," i. e. there are more components on one side of the middle than on the other. For three of these lines, 4619.67 λ, 4318.65 λ, and 4105.55 λ, the mean of the two separations upon one side is symmetrical with the position of the third component upon the other side of the middle. This is probably also true for 4050.02 λ, but does not hold for 4036.22 λ. The distance between these two components is very different for these lines. For line 4619.67 the two *s*-components on the one side do not appear separated on the weaker field plate, but present the appearance of a broadened line. There are one to two, one to three, two to three, and three to four ratios represented in the separations of components, which are usually expected to have equal values. Some of these ratios are represented more than once, but then the lines are unlike because the ratio factors must be multiplied by different magnitudes to produce the observed separations. Two lines which have the same magnitude of separation in *p*- or *s*- usually have quite different magnitudes in their respective *s*- or *p*-components, as was noted in the symmetrical quadruplets. This greatly reduces the possibility of duplicates.

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Table XVII contains a list of symmetrical triplets. In the column of intensities the red component appears first, the unseparated *p*-component next, and the blue *s*-component last. These lines are further illustrations of the fact that there are no appreciable steps in the value of triplets. When they approach each other so closely in magnitude, it is scarcely possible to isolate lines of a certain magnitude of separation and intensity and group them into series or related lines. Under such circumstances it would be much less meaningless to say that lines of similar types repeat themselves from substance to substance, and therefore infer a similarity of the substances. The same is true to a less degree with the quadruplets. A few like separations of any type[1] are useless for comparing similar chemical substances or for inferring a similarity of chemical behavior. However, these like separations have an important bearing upon that very subject, because they are natural starting points from which to begin the search for a connected relationship in the separations. Only when such relationships repeat themselves from substance to substance can one confidently assert that a similarity in the substances exists.

In such a diversity of separations, it might seem that small errors in the measurements for these triplets would, if corrected, throw them into groups differing by a small but appreciable amount. So that the actual number of separations would be small in number and possibly related to one another in some simple way, or even related to a normal value. There are some well-defined lines which have a separation of 1.07 to 1.08. Do these belong to the normal triplet whose separation is 1.105 or are they a class by themselves? I selected some of the sharpest and easiest measures of these lines and subjected them to renewed measurements upon plates of both field strengths, and was not able to change their value. I similarly treated a few lines with separations about 1.04, 1.14, and 1.18 and with a similar result. The whole could be answered satisfactorily with five times the accuracy in measurement.

[1] Purvis, *Trans. Camb. Phil. Soc.* XX, no. VIII, p. 193; and *Proc. Camb. Phil. Soc.* XIII, pt. VI, p. 325; XIV, pt. I, p. 41; XIV, pt. III, p. 217.

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There is a characteristic of these triplets that is impressive. One may choose a line with almost any magnitude of separation, and not far from it find one or more lines which have practically identical separation. The following seven lines lie in a small bundle upon the plates. Four of these, and possibly six, are duplicates. These lines are 4383.69 λ to 4374.96 λ inclusive (see table). There is another bundle between 4286.90 and 4283.25 with three lines alike. The photographic plates suggest many such bundles or groups. Naturally, other types than triplets may be present in these bundles. These at once suggest those recurring groups in those substances in which series have been found. This fact, together with the numerous close companions having like separations, would suggest that hope for relationship among the thorium lines was not forlorn.

Table XVIII is a list of unsymmetrical triplets not included in Table XIX. Stronger exposure may reveal other components for 3294.76. The line as recorded is uncommon rather than unsymmetrical. The *s*-component is in the zero position and the *p*-components separated.

Table XIX contains a list of lines in a very small portion of the spectrum. The spark spectra was obtained from thorium chloride upon carbon electrodes. About 3885 λ a carbon band begins whose lines are troublesome for some distance. As usual, I was omitting these lines of zero separation, but found that I was omitting many lines from Exner's and Hascek's tables. Close measurement of some of these unseparated lines showed that they agreed so closely with the tabulated wave-lengths which I was omitting that there could be no doubt as to their identity. Those which were found separated were unsymmetrical. Unseparated lines are supposed to arise from compounds. The carbon band lines which are unseparated are attributed to cyanogen. A few of the lines in this region Exner and Hascek mark cyanogen. However, all but one of these show separation. Many not attributed to cyanogen fail to show any separation whatsoever. These may be due to compounds, but it is only conjectural. Their behavior is generally very peculiar. In my study of zirconium, I noted that most of the lines of zero separation looked like unre-

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solved types, which would probably separate with stronger field. The unresolved lines of thorium have generally a different appearance, and most of them are probably of an inseparable type. There are a few of these lines distributed throughout the spectrum, but the most of them are found in the small region of Table XIX.

Comparison of the intensities of the *s*- and *p*-components with the corresponding no-field lines showed that there was no uniformity in their ratio to the intensities of no-field lines, and therefore no uniformity in their ratio to each other. It is a well-known fact that the exposure of the plates must be many times longer when the spark is in the magnetic field. Possibly, it is equally well known that the relative intensities of the lines change in the magnetic field. This is attributed to the change in the character of the spark. In the simplest theory of the triplet the *s*-component is supposed to be half the intensity of the *p*-component. Observation shows cases where the intensities are the reverse. When one considers an unseparated line, the simplest assumption would be that the field would change *p*- and *s*-components relatively the same, and that the intensity of the vibrations parallel and perpendicular to the lines of force would be the same. However, in comparing the *p*- and *s*-components with the no-field line intensities and with each other, the ratio of their intensities was found to vary in the same way as observed in the triplets. From a comparison of many lines one might infer that the *p*-exposures are at least 25 per cent stronger than the *s*-exposures. But here, one may assume any value less than twofold, for the relative exposure of the *p*- and *s*-plates, and then will find only a small number of the lines to have equal intensity for both *s*- and *p*-exposures. The inference seemed to be that the lines were not vibrating with equal intensity parallel and perpendicular to the lines of force. I soon found there was a tendency for some of these lines to group themselves into pairs, i. e. for one line there was a greater luminosity perpendicular to the lines of force than parallel thereto, and for an adjacent line or close companion the phenomenon was reversed. This reminds one of the close companionship of many of the triplets. There are cases where sev-

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eral of these lines may be associated in close groups. Some of these groups have *s*- and *p*- nearly equal. Other groups will have *p*- stronger than *s*- or vice versa. The behavior of these lines led to placing them in a separate table (Table XIX), and to record the intensities for the no-field lines (designated "no f") as well as the intensities of the *p*- and *s*-components. Special citations from this table would be scarcely necessary unless one could collect them into definite, well-defined, and related groups. A further characteristic is that this list of lines begins very suddenly at its red end, near the beginning of the carbon band. The blue end of the list is nearly reached at 3700 λ, but there seem to be a few scattering lines belonging to the class as far as 3656 λ. There are very few symmetrically separated lines toward the red end of the group, but before reaching the end of the group the symmetrical lines predominate.

There were some of these lines of zero separation which did not seem to have exactly the same position upon the no-field *s*- and *p*-plates. The lines upon the no-field plates were, in general, exceptionally sharp. But these unsymmetrical lines were always broadened. Take lines 3864.04 λ and 3751.22 λ. When the corresponding *p*- and *s*-components are compared with each other, one sees an appreciable difference in position. When they are compared with the corresponding no-field lines, the *s*-components fall upon one side and the *p*-components upon the other side of these broad lines. Two adjacent lines, 3870.30 λ and 3870.13 λ, have the *s*-components of the former displaced toward the red, and of the latter displaced toward the blue. The no-field lines are again broad in both cases, and the *s*- and *p*-components sharp. Also, these *s*-components do not fall outside of the no-field line. Some other illustrations might be taken from the table. The error naturally increases here, and one should not attach much importance to the recorded values of the latteral displacements. But that there are displacements of some of the *s*- and *p*-components without separation, as well as a variation in the ratio of their respective intensities from line to line, seems probable. This same broadness or diffuseness upon one side occurs for a few no-field lines which are found to have one of the corresponding *s*-components broader

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than the other. This action suggests that one has here a pair of close double lines differing but slightly in separation.

Table XX gives a few (38) scattering unseparated lines. There seem to be some easily recognized pairs and groups here. In the table, the pairs are shown in small brackets, and the groups in large brackets. The lines not included in the brackets are more scattered. For the shorter wave-lengths there is increasing probability of small separations escaping one's notice.

GENERAL REMARKS.—It is among the lines which have several components that duplications are most easily recognized. It is also easy to recognize their repetition from substance to substance. But this might be misleading. For if the magnitudes of the separations for a particular number of components change with increased number of lines they ultimately differ by only small amounts, then one certainly would have separations found in other substances, and a type, therefore, could have no particular meaning. This is too well known among triplets to need comment. It is also true in thorium quadruplets. There are in this substance a number of lines whose separations are reasonably similar to separations which I found in yttrium and zirconium. With such a list of quadruplets and such diversity of separation as found in thorium, it is rather surprising, however, that no quadruplet was found which approached reasonably near to the magnitude of the separation in the quadruplet principal series.

With the lines having five or more components in thorium there are few duplications, and as the number of components increases, the number of representatives of the different types correspondingly decreases. So that there is practically no chance to apply Preston's law in these lists.

As found by myself and others, and in particular by Runge, the successive separations in these several component's lines are, for each particular line, multiples of small values called 'intervals,' which Runge[1] first showed were multiples of aliquot parts of a normal separation. In thorium these small intervals are not as near to aliquot parts of the normal a as one should desire for

[1] *Phys. Zeit.* 8, p. 15, 1907.

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accurate confirmation of such a relationship. But the multiple relationship is frequently very easily recognized.

PART III. CONCLUSIONS

1. Lines which have six or more components in thorium are relatively very few. The separations of a great many of these are multiples of small values. But these small values are not closely related to aliquot parts of a "normal" separation.

2. There are numerous lines unsymmetrical both in separation and in intensity. The stronger component is always least displaced.

3. There are a few lines with an unequal number of components upon the two sides of the zero position.

4. There are a great many lines unsymmetrical in intensity, which fail to show any dissymmetry in position.

5. The components are often unsymmetrical in width, i. e. one component is sharp and its opposite companion is broad. Some of the latter look as if they might separate with stronger field and give lines of the type in conclusion 3.

6. There are numerous lines unseparated in the magnetic field, but very peculiarly affected thereby. Some of them vibrate more strongly perpendicular to the lines of force than parallel thereto, and others vice versa. Some of these are possibly related in pairs. Others may belong in groups.

7. Numerous triplets have one or more close companions of like separation, which suggest pairs and groups of closely related lines.

8. There is often a multiple relationship in the magnitude of the separations of unsymmetrical components. This would be merely a coincidence, if the dissymmetry is independent of the field strength or proportional to the square of the same.

9. The types of separations for lines which have several components are not repetitions of types which I had found in other substances. Reasons are given for excluding triplets and quadruplets from such a comparison.

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TABLE I

λ 4282.20			λ 4116.91		
i	Δλ/λ²	A	*i*	Δλ/λ²	A
5.....	(—2.26) *s*	(14×.17)	7.....	—2.37 *s*	(14×.17)
1—.....	.... *s*		1—.....	—.... *s*	
1—.....	.... *s*		1—.....	—.... *s*	
1—.....	—1.22 *p*	(7×.17)	1.....	—1.19 *p*	(7×.17)
1.....	— .87 *p*	(5×.17)	2.....	— .86 *p*	(5×.17)
2—.....	— .54 *p*	(3×.17)	3	— .50 *p*	(3×.17)
2.....	— .17 *p*	(1×.17)	3.....	— .17 *p*	(1×.17)
2.....	+ .17 *p*		3	— .17 *p*	
2.....	+ .51 *p*		3	+ .51 *p*	
1.....	+ .86 *p*		2	+ .85 *p*	
1.....	+1.22 *p*		1.....	+1.20 *p*	
.....	+.... *s*		1—.....	+ ... *s*	
.....	+.... *s*		1—.....	+.... *s*	
5.....	(+2.26) *s*		7.....	+2.37 *s*	

TABLE II

λ 4086.71			λ 4019.30		
i	Δλ/λ²	A	*i*	Δλ λ²	A
5.....	+ 2.83 *s*	13×.214	5.....	+1.99 *s*	?
3.....	+ 1.95 *s*	9	3.....	+1.45 *s*	
4.....	+ 1.25 *p*	6	1—.....	+ .89 *s*	
1.....	+(1.05) *s*	5	8.....	+ .80 *p*	
5.....	+ .42 *p*	2	1	+ .40 *s*	
1—.....	+(.16) *s*	?	6	+ .35 *p*	
1—.....	—(.16) *s*	?	6	— .34 *p*	
5.....	— .41 *p*	4/*a*/11	.....	+....*s*	
1	—(1.05) *s*	16	8.. ...	+ .80 *p*	
3	— 1.26 *p*	13	.....	+....*s*	
3.....	— 1.95 *s*	19	.....	+....*s*	
4.....	— 2.83 *s*	28	5	+1.99 *s*	

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TABLE III

λ 4142.87			λ 3434.09		
i	Δλ/λ²	A	*i*	Δλ/λ²	A
1.....	—2.25 *p*	10×.226	2.....	—2.36 *s*	7×0.34
5.....	—1.35 *p*	6	1—....	— ... *s*	
2	—1.34 *s*	6	3.....	—1.04 *p*	3
1.....	—0.68 *s*	3	1—....	— ... *s*	
1+.....	—0.47 *p*	2	4.....	—0.34 *p*	1
1.....	0.00 *s*		1—....	... *s*	0 ?
1..	+0.47 *p*		4.....	+0.34 *p*	
.....	+0... *s*	0	1—....	+ ... *s*	
2.....	+1.32 *s*		3.....	+1.03 *p*	
.....	+1.35 *p*	0	1— ...	+ ... *s*	
1.....	+2.36 *p*		2.....	+2.36 *s*	

TABLE IV

λ 4094.99			λ 3929.74		
i	Δλ/λ²	A	*i*	Δλ/λ²	A
1+.....	—1.51 *s*	?	3.....	—1.01 *s*	?
2+.....	—0.92 *s*		4.....	—0.84 *p*	
10.....	—0.78 *p*		1.....	—0.73 *s*	
1+.....	—0.41 *s*		5.....	—0.27 *p*	
1.....	—0.36 *p*		1—....	— ... *s*	
1.....	+0.36 *p*		.....	+ ... *s*	
1+.....	+0.41 *s*		5.....	+0.28 *p*	
10.....	+0.78 *p*		.....	+ ... *s*	*sb* diffuse
2.....	+0.96 *s*		3.....	+0.83 *p*	
1.....	+1.51 *s*		.....	+ ... *s*	

TABLE V

λ 3704.16		
i	Δλ/λ²	A
1.....	—2.08 *s*	?
1.....	—1.33 *s*	
1.....	—0.70 *p*	
1.....	—0.56 *s*	
1+.....	0.00 *p*	
1.....	+0.57 *s*	
2.....	+0.73 *p*	
.....	+ ... *s*	diffuse
.....	+ ... *s*	diffuse

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TABLE VI

λ 4277.49			λ 4180.15		
i	$\Delta\lambda/\lambda^2$	A	*i*	$\Delta\lambda/\lambda^2$	A
1.....	−1.50 *s*	?	5.....	− ... *s*	Brd. poss.
2.....	−0.97 *s*		3.....	−1.44 *p*	2 or 3
12.....	−0.70 *p*		1.....	−1.08 *p*	comps.
1.....	−0.46 *s*		1−....	−(?) *p*	
1.	+0.46 *s*		1−....	+(?) *p*	
10.....	+0.70 *p*		1.....	+1.09 *p*	
2.....	+0.99 *s*		3.....	+1.44 *p*	
1.....	+1.50 *s*		.....	+ ... *s*	0

λ 3649.90		
i	$\Delta\lambda/\lambda^2$	A
1+.....	−2.86 *s*	?
1−.....	− ... *s*	
1.....	−1.20 *p*	
2.....	0.00 *ps*	
1−.....	+1.20 *p*	
.....	+ ... *s*	
1+.....	+2.86 *s*	

TABLE VII

λ 3792.52		
i	$\Delta\lambda/\lambda^2$	A
3.....	−1.94 *s*	?
1.....	−1.33 *p*	
1.....	−1.05 *s*	
12.....	0.00 *p*	
1.....	... *s*	
1.....	+1.33 *p*	
3.....	+1.94 *s*	

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TABLE VIII

λ 4448.00		λ 4202.02		λ 4182.15 *	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1+...	−1.82 *s*	1−....	−0.84 *p*	.....	− ?
6.....	−0.77 *s*	4.....	−0.69 *s*	6....	−1.10 *s*
10.....	−0.55 *p*	2.....	−0.27 *p*	10.....	−0.79 *p*
8.....	+0.56 *p*	2.....	+0.28 *p*	8.....	+0.79 *p*
5.....	+0.76 *s*	4.....	+0.69 *s*	4.....	+1.11 *s*
1.....	+1.87 *s*	1.....	+0.83 *p*	.....	+ ? *s*

*The external pair of components may belong to other lines, which would leave this line a quadruplet.

λ 4178.20		λ 4069.40		λ 3549.83	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
3.....	−1.06 *s*	8.....	−1.22 *s*	1+...	−1.92 *s*
10.....	−0.78 *p*	2.....	−0.50 *p*	1.....	−0.83 *s*
1.....	−0.52 *p*	4.....	−0.18 *p*	6.....	−0.60 *p*
1.....	+0.52 *p*	4.....	+0.18 *p*	5.....	+0.60 *p*
10.....	+0.78 *p*	3.....	+0.50 *p*	1.....	+0.83 *s*
3.....	+1.06 *s*	8.....	+1.23 *s*	1.....	+1.92 *s*

λ 3338.00 *	
i	Δλ/λ²
6.....	−1.81 *s*
1.....	−0.89 *p*
1+....	−0.36 *p*
1+...	+0.32 *p*
1.....	+0.90 *p*
6.....	+1.80 *s*

*The *p*-components are measured in the second order and *s*-components in the first order.

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TABLE IX

λ 4624.22		λ 4499.13*		λ 4369.50†	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
1—....	—(1.89) *s*	1.....	—(1.53) *s*	2.....	—2.07 *s*
2.....	— 0.41 *p*	1+ ...	—(0.43) *p*	1....	—0.98 *p*
3.....	0.00 *p*	2.....	0.00 *p*	5.....	0.00 *p*
2.....	+ 0.41 *p*	1.....	+(0.43) *p*	1.....	+0.98 *p*
1—....	+ 1.89 *s*	1.....	+(1.89) *s*	2.....	+2.07 *s*

* The *s*- are diffuse inward and probably other components are present.
† The *s*- are diffuse and the *p*- have diffuse background.

λ 3892.40		λ 3872.51 *		λ 3842.10†	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
1.....	—1.91 *s*	.....	— *s*	12....	1.75 *s*
4	—0.66 *p*	.....	— *p*	2....	1.38 *p*
5.....	0.00 *p*	1.....	0.00 *p*	30....	0.00 *p*
3.....	+0.66 *p*	5.....	0.57 *p*	1+..	1.40 *p*
1.....	+1.91 *s*	3.....	1.30 *s*	12...	1.75 *s*

* *pr* and *sr* are overlapped.
† The middle *p*- may be double.

λ 3589.47 *	
i	$\Delta\lambda/\lambda^2$
.....	— ...
1.....	—0.55 *p*
1+...	0.00 *p*
1.....	+0.57 *p*
.....	+ ... *s*

* The *s*- are both overlapped.

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TABLE X

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
4689.33	1+, 1	.67		4357.79	2	1.29	
	2 , 1	.29			3	.80	
12.06	1	1.14		44.50	5 , 6	1.13	
	2 , 1+	1.07			10 , 12	.59	
03.05	1 , 1—	1.03		34.11	2	1.35	
	2 , 1+	.59			3	.67	
4540.60	1+, 2	1.04		32.09	1+, 2	1.18	
	5	.55			3 , 2	.42	
31.90	1+, 2	1.18		28.86	3	1.25	*sr o*
	4 , 5	.55			3 , 2	.34	
4493.57	2	1.00		27.30	1 , 2	1.09	
	6 , 5	.86			1 , 2	.43	
92.02	1	(1.24)		10.19	3	1.18	*
	1+, 1+	(.28)			4 , 2	.19	
74.25	2	1.25		4297.53	1 , 1+	1.23	
	5 , 4	.53			2 , 3	.64	
58.17	1 , 1+	.86		78.50	1+	.96	
	5 , 3	.55			2 , 1+	.49	
39.26	7 , 8	1.04	*sb* probably *o*	74.19	4	.83	*sr o*
	12 , 10	.59			4	.42	
36.40	10 , 1+	(.96)	*sr o*	67.68	1+, 1	(1.81)	
	2 , 2	.96			4 , 2	.79	*pr* probably *o*
26.18	2	1.35		65.27	1	(1.60)	
	5 , 3	.49			2 , 3	1.54	
09.10	2	1.27		56.25	2	.65	
	3 , 2	.49			2	.42	
01.87	2	1.50		33.41	4	1.30	
	4 , 5	1.22			6 , 4	.71	
4374.08	4 , 4	1.18	*pr o* by 4.33	29.58	4	1.29	
	8 , 4	.56			8	.94	

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TABLE X—CONTINUED

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
4195.04	1 ,	(1.48)		4085.22	8	1.13	
	1+ , 1-	(.91)			15	.78	
88.75	1	(1.72)		77.89	1—, 1+	(1.29)	
	1	(1.08)			3	.28	
82.15	6 , 4	1.11		68.15	1	(2.14)	
	10 , 8	.79			1 , 2	(1.14)	
72.52	6	1.32		55.00	1	(1.76)	
	3 , 2+	.15	p 2d O		1	(.59)	
68.81	1	(1.16)		53.68	1	(1.30)	
	3	.61	2d O		3 , 4	1.06	
48.35	5	.73		41.36	2	1.18	
	5 , 4	.19	2d O		6 , 5	(.13)	2d O
40.42	5 , 3	1.16		32.69	2 , 5	(.66)	*sb o*
	5	.20	2d O		8 , 5	(.90)	*pr o*
39.53	3 , 3	1.33		41.00	5 , 4	1.20	
	4 , 5	.85			4 , 5	.40	p 2d O
32.95	8 , 7	1.08		29.13	.. ..	(1.13)	*s o*
	12 , 10	(.12)	2d O		2	(.24)	
31.00	3	1.25		27.82	1	(1.23)	
	4 , 5	.36	p 2d O		2	.50	
31.20	2	1.27		26.30	3 , 2	1.21	
	1 , 1+	.19	p 2d O		2	.26	
23.72	4 , 3	1.28		17.65	1+	(1.06)	
	1 , 1+	(.25)	p 2d O		2	.56	
08.61	8	1.03		01.22	1	(1.10)	
	10 , 12	.33	2d O		3	.83	
04.00	4	1.33	†	3982.33	1 , 2+	1.27	*sb o, pb o*
	3	.82	p 2d O		3 , 4	1.42	$p>s$
4003.00	5 , 4	1.17		81.28	6 , 8	1.36	possibly each
	1	(.17)	p 2d O		10	.78	*s*-doublet

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TABLE X—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3979.20	2 , 3	1.20		3832.87	.. 2	+1.28	*r* components
	4 , 3	.76			.. 2	+ .65	lost in 3.10
74.38	1+	1.35		30.70	.. 1+	(+1.33)	*r* components lost
	4 , 3	.67			.. 3	+1.31	in 0.93 *p*=*s*
67.52	2 , 3	1.26	*p* possibly unsymmetrical	21.57	4 , 3	1.00	
	6 , 4	.32	*p* 2d *O*		8 , 6	.36	2d *O*
64.96	1	(1.27)		02.65	1	(.64)	
	2	.30			1	(.65)	*p*=*s*
63.33	2	1.26		3773.94	2 . 3	1.06	*sb o*
	3	.72			6 , 5	.33	2d *O*
57.24	1+, 1	(1.32)		63.04	6	.80	
	2+, 2	.60			2 .	.63	2d *O*
37.14	8 , 8	1.07	‡	50.82	1 , 1+	1.18	
	10 , 8	.53			3	1.14	*p*=*s*
51.25	.. 1	(+2.10)		47.73	8	1.04	
	1 , 3	.41			12	(.24)	2d *O*
13.95	1	(.95)		46.68	1	(.98)	
	2+, 2	.67			1	(.59)	
12.41	3	1.18		41.40	20	1.15	
	4 , 3	.45	2d *O*		30	.39	2d *O dr*
08.03	1+, 1	(1.33)		31.60	3	1.41	
	2 , 1+	.98			2 , 3	.47	
00.25	1+, 2	1.41		30.92	5	1.28	*s* broad possibly
	1+, 2	.45			8	.54	double 2d *O*
3894.53	1	1.50		28.04	2	1.30	
	1+	.84			3	.50	
59.98	10 , 12	1.19		20.52	2 , 6	(1.18)	*sb o*
	8 , 6	.38	2d *O*		7	.64	
58.72	2	.50		18.02	5 , 3	(1.46)	*s*, 1st *O sr o*
	1	(.60)	*p*>*s*		2 , 1	(.20)	*p* 2d *O*

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TABLE X.—CONTINUED

λ	i	Δλ/λ²	Remarks	λ	i	Δλ/λ²	Remarks
				3042.41	4 , 5	1.13	
					4 , 3	.72	
				39.55	5 , 3	.79	
					7 , 5	.40	
				21.25	8 , 6	1.02	
					8 , 6	.20	
				20.52	1 , 2	1.32	
					3 , 2	.32	
				15.26	10 , 8	1.30	
					8 , 6	.20	
				14.16	1+ , 2	1.06	
					5 , 3	.33	
				12.57	2	1.08	
					6 , 5	.75	
				07.52	1 , 1+	1.33	
					2	.66	
				3598.31	6 , 5	.87	
					2	(.18)	
				92.92	7 , 5	1.16	
					1+ , 2	.29	
				82.15	8 , 10	1.29	
					5 , 3	.20	
				72.52	2	1.19	
					5 , 3	.33	
				59.55	4	1.08	
					6 , 5	.38	
				16.06	3 , 2	1.40	
					5 , 3	.67	
				16.50	3	1.16	
					1	(.24)	

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TABLE X—CONTINUED

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
3514.70	5	1.18		3445.87	3 , 2	1.07	
	2 , 1+	.29	*p* 2d *O*		5 , 3	.54	
13.38	1	(1.33)		41.16	2	1.30	
	1	(.63)			2	.51	*p* 2d *O*
09.33	1	(1 19)	2d *O*	39.07	3	1.30	
	1 , 3	(.70)	‖		5 , 4	.33	2d *O*
00.70	1 , 2	(1.52)		25.28	4 , 3	1.18	
	2 , 1+	(.65)			3	(.57)	
00.15	3	1.55		19.29	2 , 3	1.29	
	7 , 5	.86			6 , 5	.50	2d *O*
3499.15	3 , 2	1.28		14.59	1+	.91	
	5 , 4	.70			4 , 3	1.04	*p*>*s*
97.41	1	(1.19)		11.92	4	1.05	
	1+	(1.48)			1	.38	*p* 2d *O*
73.21	1+, 3	1 42	‖	09.37	4	1.08	
	3	.60			2 , 1+	.36	*p* 2d *O*
71.40	1+	1.36		08.76	3	1.33	
	3	.74			2 , 1	.38	*p* 2d *O*
70.08	7	1.29		3395.50	2	1.16	
	15	.55	2d *O*		2 , 1+	.68	
65.88	12	.93	2d *O*	89.77	3 , 2	.93	¶
	15 , 12	.88	Probably *p*=*s*		5 , 4	.86	
54.83	1	(1.30)		86.64	1	1.31	2d *O*
	2	.51			4 , 3	.75	
54.35	1	(1.19)		79.84	1	(1.15)	
	3	.33			1	(.45)	
52.81	6	1.75		78 70	2 , 2+	1.39	2d *O*
	4 , 3	.63	*p* 2d *O*		4 , 3	.34	
49.77	5	1.22		67.93	3 , 2	1.01	
	3	.69	*p* 2d *O*		5 , 2	.26	2d *O*

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TABLE X—CONCLUDED

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
3364.79	4	1.45		3290.25	2 , 1+	1.33	
	3 , 2+	.61	*p* 2d *O*		2 , 1+	.67	*p* 2d *O*
55.38	1+ , ..	(−.94)		86.71	4	1.71	
	2 , 3	1.05			3 , 2+	(.18)	*p* 2d *O*
49.10	5	1.26		67.14	1+, 3	1.30	
	1	.30	*p* 2d *O*		3	.85	
48.93	2	.78		45.91	5 , 4	1.46	
	1	.28	*p* 2d *O*		3 , 2	.61	*p* 2d *O*
47.72	1	(1.68)		25.51	2	1.28	
	1	(.89)			3 , 2+	.37	*p* 2d *O*
35.17	2	(1.34)		13.71	1+	(.84)	
	1	(.61)	*p* 2d *O*		1 , 1+	(.48)	*p* 2d *O*
34.72	3	(1.34)		3150.56	3 , 2	1.34	
	8 , 7	.67	*p* 2d *O*		1+, 1	(.35)	*p* 2d *O*
24.88	1+	.83					
	5 , 4	.35	2d *O*				

*The line does not apoear on no-field plates, but comparison of *s*- and *p*- plates *pr* lies almost in the middle and the deviation largely due to the *pb* component. It might be another line.

†The *s*-components of this line are broad, and each may consist of three.

‡The *p*- and *s*- are in the ratio of 1 to 2. The *s*- is like its companion triplet line 3938.01. The magnitude of the separation suggests the normal triplet 1.11. A retest was made since these were easily measured lines, but it was not possible to increase the value 1.07; if anything, the value is a trifle smaller.

§The second order no-field line is just off the plate. In the first order the lines show dissymmetry, but are too thick to measure. The line is probably unsymmetrical.

‖This line does not show on no-field plate. When the *p*-components are compared with the *s*-components they do not appear symmetrical.

¶Juxtaposition of *p*- and *s*-plates shows that the measured difference in the value of *p*- and *s*- is actually present and not an error of measurement.

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TABLE XI

λ	*i*	Δλ/λ²	REMARKS
4740.72	4	1.14	*s* broad, apparently not separated, possibly double
4612.71	1	.32	
4588.40	3	.52	6 components
4472.47	1 , 2	.31	
69.75	2 , 1	.31	
02.49	1+, 1	.79	
4388.59	1 , 1+	1.19	Probably $p > s$
87.27	2 , 1	(.71)	
61.91	2+, 2	.76	
02.25	2 , 1+	.62	
4256.42	2	(.51)	
47.73	1 , 2	(.66)	
37.25	1+, 2	(.84)	
35.59	2	1.41	
17.37	1+, 2	1.38	
4166.70	1+	(1—.90)	
	1	(+1.13)	
4158.71	3	(—.17)	
	2	(1+.22)	
4107.41	2	1.31	
4087.46	1	(.50)	
70.86	1+, 1	.37	
45.74	1	(1.23)	
29.80	3	.66	
16.48	2	1.04	
03.21	.. 4	+ 30	Quadruplet *sr* and *pr* lost in 03.39
3969.15	1+	(.51)	
81.70	1	.80	
53.53	2	.49	
52.60	1	.41	
45.96	3	.58	
45.27	2	.56	
42.95	2	1.44	
42.75	2	1.01	
3937.14	4 , 3	.51	2d *O, s o*
36.07	1+, 1	.57	
12.05	1—, 1+	.50	
3698.47	2	.40	
86.03	1	1.01	
76.88	1+, 1	.62	
75.05	2	1.60	
58.32	1+, ..	—.64	*o* 8.20
58.20	.. 3	+.47	
50.75	3	.73	
48.28	1	.54	
24.57	1	.89	
06.32	1—, 1+	.90	
3556.45	1+	1.00	

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TABLE XI—CONCLUDED

λ	*i*	Δλ/λ²	REMARKS
3516.96	5 , 3	.67	
3406.35	1 , 1—	(.36)	
3385.16	1	(1.26)	*p*>*s*
3295.44	1+, 1	.50	
62.79	8	1.29	2d *O* *
48.62	1 , 2	.80	2d *O*
3193.29	2 , 1	.54	2d *O*
90.25	3 , 2	.81	2d *O*
42.76	2	.77	1st *O*
24.47	3 , 2	.84	2d *O*
17.75	1	(.53)	2d *O*
10.12	2 , 1	.83	2d *O*
3035.21	1	(.32)	2d *O*
3002.51	1	.53	2d *O*

* The *s*- is very peculiar. It is spread over a field about 40 per cent wider than the *p*- separation.

TABLE XII

λ 3722.06	
i	Δλ/λ²
2.....	+1.59 *s*
2.....	+ .99 *s*
8.....	+ .90 *p*
2.....	+ .38 *s*
2.....	— .32 *s*
2.....	— .45 *p*
2.....	—1.02 *s*
6.....	—1.11 *p*
1+.....	—1.62 *s*

TABLE XIII

λ 3959.38	
i	Δλ/λ²
1.....	—2.00 *s*
1.....	—1.42 *p*
1.....	— .80 *s*
5.....	0. *p*
1.....	+ .98 *s*
1+.....	+1.23 *p*
1+.....	+1.87 *s*

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TABLE XIV

λ 4295.25*		λ 3998.01†		λ 3828.58‡	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1....	—2.45 *p*	—.....	... *s*	2.....	— 1.63 *s*
1.....	—1.94 *s*	—....	... *s*	1.....	— .90 *s*
5....	—1.11 *s*	12.....	—.66 *p*	7.....	— .55 *p*
12.....	0. *p*	10.....	+.97 *p*	5....	+ .45 *p*
7.....	+1.11 *s*	—.....	.. *s*	2.....	+ .96 *s*
1.....	+1.77 *p*	—.....	.. *s*	1....	+(1.30) *p*

*The outside pair of *p*- may be foreign. In second order the zero *p*- is diffuse on the red, looking like a companion weak line. No-field plate line is also diffuse on the red. The middle of the *s*- was assumed to be midway between the two stronger components. If there are two lines here the principal one is a symmetrical triplet and the weaker one a symmetrical quadruplet with the separation of *p*- greater than *s*-.

†There are four if not six components in each of the *s*-.

‡The outer blue component possibly belongs to the adjacent line.

λ 3678.19*	
i	Δλ/λ²
1+....	—2.20 *s*
2.....	—1.36 *s*
10.....	— .26 *p*
4.....	+ .26 *p*
4.....	+ .88 *s*
2.....	+2.08 *s*

*On no-field plate second order there are two lines, unless it is reversal which should have shown in first order. Exner and Hascek give but one line. Supposing it two lines, the inner pair of *s*- are symmetrical with the stronger line (or red *p*-), but one is at loss to know how to dispose of the outer pair of *s*-.

TABLE XV

λ 4342.45		λ 4115.85		λ 4100.57	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1—...	—(1.56)? *s*	2.....	—1.66 *s*	2.....	—1.64 *s*
6.....	1— 1.11 *s*	2.....	— .84 *p*	2.....	— .52 *p*
12.....	— .54 *p*	2.....	0.00 *p*	1+...	0.00 *p*
5.....	+ .80 *p*	1+....	+ .42 *p*	3.....	+ .69 *p*
6.....	+ 1.10 *s*	2.....	+1.66 *s*	3.....	+1.64 *s*

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TABLE XV—CONTINUED

λ 4075.92		λ 3938.86		λ 3822.33	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
2.....	— .80 *s*	3.....	—1.39 *s*	6.....	—1.03 *s*
3.....	—1.27 *p*	3.....	—1.23 *p*	4.....	— .85 *p*
3.....	0.00 *p*	1.....	0.00 *p*	2.....	— .17 *p*
3.....	+ .95 *p*	8.....	+ .81 *p*	2.....	+1.12 *p*
1+....	+ .80 *s*	4.....	+1.39 *s*	3.....	+1.33 *s*

λ 3709.82	
i	$\Delta\lambda/\lambda^2$
1.....	—(1.55) *p*
1.....	—(.97) *s*
5.....	0.00 *p*
3.....	+ .50 *s*
—.....	+ ? *p*

TABLE XVI

λ 4619.67		λ 4352.87		λ 4347.40	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
1+...	—1.17 *s*	3.....	—1.35 *s*	2.....	—1.62 *s*
2.....	—1.04 *s*	12.....	— .51 *p*	4.....	— .43 *p*
10.....	0.00 *p*	4.....	+1.03 *p*	1+...	+ .81 *p*
5.....	+1.11 *s*	3.....	+1.35 *s*	2.....	+1.62 *s*

λ 4318.65		λ 4165.92		λ 4164.43	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
5.....	—1.45 *s*	1.....	—(1.05) *s*	5.....	—1.18 *s*
10.....	0.00 *p*	3.....	— .99 *p*	4.....	— .71 *p*
3.....	+ .89 *s*	4.....	+ .76 *p*	3.....	+ .44 *p*
1.....	+2.00 *s*	1.....	+(.88) *s*	3.....	+1.18 *s*

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TABLE XVI—CONTINUED

λ 4105.55		λ 4060.05		λ 4050.02	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
2.....	—1.31 *s*	1.....	—(1.03) *s*	3.....	—1.59 *s*
1.....	— .76 *s*	1—....	—(.70) *p*	8.....	0.00 *p*
8.....	0.00 *p*	2.....	+(.36) *p*	1....	+ .84 *s*
6.....	+1.04 *s*	1.....	+(1.03) *s*	1....	+2.44 *s*

λ 4036.22		λ 4027.15		λ 3993.86	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1.....	—1.73 *s*	2.....	—1.15 *s*	1.....	—(1.10) *s*
1.....	— .55 *s*	3.....	— .27 *p*	1+...	—(.38) *p*
6.....	0.00 *p*	2	+ .38 *p*	1.....	—(.76) *p*
3.....	+1.84 *s*	2.....	+1.15 *s*	1.....	+(1.10) *s*

λ 3955.28		λ 3895.55*		λ 3873.56	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1+....	—1.53 *s*	8.....	—1.02 *s*	2.....	— .66 *s*
5.....	— .74 *p*	5.....	— .11 *p*	5.....	— .31 *p*
3.....	+1.38 *s*	2.....	+ .23 *p*	1.....	+ .96 *p*
2.....	+1.48 *p*	8.....	+1.02 *s*	1.....	+1.30 *s*

*The *s*- measured in first, the *p*- in second order.

λ 3867.42		λ 3866.21		λ 3842.69	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1.....	— .38 *s*	7.....	— .60 *s*	2.....	—1.25 *s*
3.....	— .42 *p*	3.....	— .82 *p*	2.....	— .38 *p*
1+....	+1.32 *p*	6	+ .46 *p*	1... .	+ .76 *p*
1.....	+ .38 *s*	3.....	+1.26 *s*	1.....	+1.56 *s*

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TABLE XVI—CONTINUED

λ 3838.01		λ 3827.07		λ 3815.95*	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
2.....	—1.54 *s*	1.....	— .66 *s*	3.....	— .53 *s*
4.....	0.00 *s*	3	— .80 *p*	5.....	— .19 *p*
12.....	0.00 *p*	5.....	+ .52 *p*	1.....	+1.68 *p*
3.....	+1.70 *s*	2.....	+ .38 *s*	1.....	+1.73 *s*

*The components of intensity 1 might belong to line 3815.78, the blue components of which are visible. The latter would then be unsymmetrical. If this were accepted then one has no blue components for this stronger line.

λ 3814.12		λ 3813.79*		λ 3790.10†	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
1—....	—(.90) *s*	—.....	— .— *s*	5.....	— .51 *s*
1.....	—(.79) *p*	3.....	— .40 *p*	—....	—0.00 *p*
1.....	+(.79) *p*	1.....	+ .53 *p*	2.....	+ .68 *s*
2.....	+(.32) *s*	3.....	+1.31 *s*	1.....	+ .98 *s*

*Exner gives 3813.85 for this iine which would make the dissymmetry greater.

†The *sr* is overlapped by *sb* of 3790.26.

λ 3783.15*		λ 3778.00†		λ 3776.10	
i	Δλ/λ²	*i*	Δλ/λ²	*i*	Δλ/λ²
—.....	—(1.13) *s*	3.....	— .27 *s*	4.....	—1.08 *s*
8.....	— .51 *p*	2.....	— .27 *p*	6.....	—1.08 *p*
6.....	+ 1.00 *p*	1—....	+ .94 *p*	5.....	+1.59 *p*
6.....	+(1.13) *s*	1.....	+1.16 *s*	3.....	+1.55 *s*

*The *sr* is overlapped. Exner's 3783.27 not found. Could this be it?

†It seemed that the weak blue components might belong to some other line, which would leave *s*- and *p*- identical in position but only with red components.

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TABLE XVI—CONTINUED

λ 3775.47		λ 3771.80*		λ 3770.25	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
1—....	—1.05 *s*	3.....	— 1.05 *s*	—....	—(1.17) *s*
2.....	— .57 *p*	2.....	— .91 *p*	6.....	— .65 *p*
1.....	+ .85 *p*	1—....	+(1.81) *p*	4.....	+ .95 *p*
2.....	+ .48 *s*	1—....	+(1.55) *s*	3.....	+ .55 *s*

*An overlap on *pb*. The *sb* is broad, possibly double. Its middle measures as given. It is certainly unsymmetrical.

λ 3751.90*		λ 3712.80		λ 3617.88†	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
1—....	—(...) *s*	2.....	—1.36 *s*	1—...	— ... *s*
1.....	0.00 *s*	3.....	—1.30 *p*	2.....	—1.02 *p*
2... ..	0.00 *p*	5.....	+ .59 *p*	1.....	+2.04 *p*
1.....	+ 1.46 *s*	2.....	+1.36 *s*	1—...	+ ... *s*

*This line may be symmetrical. The *sr* is diffuse.

†The *s*- is diffuse but smaller than *p*-.

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TABLE XVII

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
4761.3	1+ , 3 , 1+	.99		4525.04	1 , 4 , 1	(1.17)	*sr o* broad
52.6	3 , 6 , 6	1.82		16.20	1+ , 6 , 1+	1.27	
40.72	1 , 4 , 1	0.	*s* .7 Aengstroms	12.70	1+ , 5 , 1+	1.34	
24.92	1 , 2 , 1	(1.25)		10.73	15 , 25 , 15	1.08	
23.93	3 , 7 , 5	.94		00.21	1+ , 6 , 1+	1.37	
18.79	2 , 3 , 1	1.31		4496.53	4 , 8 , 4	1.35	
06 41	1 , 3 , ..	—(1.35)		92.45	2 , 4 , 2	1.01	
05.92	6 , 10 , 5	(.98)		88.83	5 , 15 , 5	1.30	
00.35	1+ , 4 , 1	.88		87.67	6 , 10 , 6	1.45	
4694.67	1 , .. , 1	(1.45)		65.52	10 , 25 , 10	1.68	
94.25	4 , 10 , 3	.98		61.91	2 , 6 , 1+	1.18	
91.25	2+ , 8 , 3	1.37		61.28	2 , 10 , 1+	1.25	
51.76	6 , 12 , 5	1.12		55.20	1+ , 7 , 1	(1.00)	
40.26	1 , 3 , ..	—(.65)	*sb o*	54.62	2 , 7 , 1+	.90	
39 86	5 , 5 , 2	(1.23)	*sr o*	43.30	1+ , 5 , 1+	(1.28)	
31.94	4 , 12 , 4	.98		41.05	8 , 15 , 8	1.64	*b* wider than *r*
25.24	1 , 3 , 1	.99		36.20	1 , 2 , 1	(.99)	
09.53	2 , 6 , 2	.65		33.12	10 , 20 , 10	.95	
4589.31	1 , 3 , 1	(1.30)		27.85	1+ , 7 , 2	1.45	
81.78	1+ , 6 , 2	1.10		16.40	3 , 10 , 2+	.76	
66.85	1+ , 4 , 1	(1.02)		10.60	1 , 5 , 2	1.38	
63.48	8 , 12 , 6	1.19		08.61	1 , 2 , 1	(1.29)	
44.70	3 , 7 , 2	.83		00.56	1 , 3 , 1	(1.08)	
37.86	3 , 10 , 3	1.31		4399.25	4 , 10 , 3	1.09	
34.30	3 , 8 , 2	.65		98.10	3 , 8 , 4	.87	
33.50	6 , 12 , 5	1.46		96.67	2 , 6 , 2	.81	
32.47	3 , 8 , 2	.64		95.09	5 , 12 , 5	1.23	
29.67	1— , 3 , 1—	.—	Too weak	93.28	2 , 6 , 2+	1.27	
27.93	1 , 1+ , 1	.—	Too weak	91.30	30 , 50 , 30	1.43	
25.31	1 , 6 , 1	(1.14)	*sb o* broad	83.69	1+ , 5 , 1	1.28	

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TABLE XVII—CONTINUED

λ	i	Δλ/λ²	REMARKS	λ	i	Δλ/λ²	REMARKS
4382.10	25 , 50 , 25	1.11		4313.17	5 , 7 , 3	1.42	
81.61	.. , 10 , 5	+1.14		07.40	2 , 5 , 1+	1.77	
78.34	1+ , 5 , 1+	1.11		06.57	1+ , 7 , 2	1.70	
77.50	2+ , 8 , 2+	1.14		00.98	1 , 3 , 1	(.78)	
75.77	1 , 5 , 1	1.12		4299.98	3 , 8 , 2	1.09	
74.96	6 , 15 , 6	1.11		98.80	3 , 8 , 5	.76	
67.12	1 , 4 , 1	1.18		91.95	1 , 5 , 1+	(1.12)	
66.08	2 , 5 , 2	1.74		90.52	1 , 4 , 1+	(1.14)	
62.55	1 , 4 , 1	(1.34)	*sb* broad	88.23	5 , 6	0.	*s* sharp center with background diffuse; in width .45 Aengstrom
61.50	6 , 10 , 4	1.15					
59.58	1+ , 4 , 1+	1.08					
58.70	2 , 8 , 2	1.12					
55.50	1 , 12 , 1	.86		86.90	2 , 4 , 2	1.17	
53.55	4 , 12 , 4	0.	*s* .45 Aengstroms	86.38	3 , 8 , 3	1.17	
51.64	1+ , 5 , 2	1.21		85.38	2 , 4 , 2	.72	
51.00	4 , 12	0.	*s* .45 Aengstroms	85.15	4 , 8 , 4	.86	
49.21	1+ , 3 , 1+	1.55		83.70	6 , 10 , 8	1 35	
48.73	2 , 4 , 2	1.08		83.25	1 , 3 , 1	(1.17)	
46.59	1+ , 5 , 2	1.07		74.51	2 , 4 , 2	1.15	
41.22	6 , 15 , 6	1.00		73.54	10 , 20 , 10	1.53	
38.30	1+ , 4 , 1	(1.00)		71.26	1+ , 1+, 1	(.95)	
37.55	8 , 15 , 8	1.15		70.49	3 , 5 , 4	1.96	
36.70	1— , 3 , 1	(1.92)		64.52	1 , 3 , 1+	1.26	
35.89	8 , 20 , 8	1.21		64.23	1 , 2 , 1	(.78)	*sr o*
29.65	2 , 8 , 2	1.20		63.50	4 , 7 , 4	1.18	
20.77	2 , 10 , 2	(1.54)		62.90	1 , 4 , 1	(1.32)	
20.64	3 , 1 , 3		*s o*	61.64	1 , 3 , 2	(.86)	*sb o*
20.31	3 , 2 , 8	.23	*o*	61.38	2 , 1+, 1	(.88)	*sr o*
18.71	3 , 8 , 2	.92		60.47	3 , 4 , 2	1.66	Broad
15.52	1 , 5 , 2	.85		57.58	2+ , 4 , 2	.76	

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
4254.60	2 , 4 , —	(1.62)	This line and three following give by overlaps only five components	4214.15	1 , 1 , 1	(1.59)	
				13.21	2 , 4 , 1+	.79	
				11.60	4 , 8 , 4	1.18	
				11.05	2 , 6 , 2	.73	
				10.84	1 , 2 , 1	.71	
54.09	— , 4 , —	1.35		09.01	25 , 50 , 25	1.16	
54.00	— , 4 , —	(1.08)		06.83	2 , 5 , 2	1.31	
53.66	— , 4 , 3	(1.11)		4199.18	1 , 3 , 1+	2.05	
50.53	6 , 15 , 6	1.13		96.02	7 , 12 , 2	1.63	*sr o*
49.80	2 , 10 , 2	.78		95.72	3 , 10 , 4	1.35	
48.10	8 , 15 , 8	1.02		94.27	2 , 2 , 2	1.16	
44.05	3 , 10 , 3	1.26		93.15	4 , 5 , 3	1.11	
42.84	1 , 3 , 1+	(1 00)		92.03	4 , 5 , 2	1.20	
40.67	2 , 5 , 2	1.53		84.48	1+ , 3 , 2	.81	
35.12	2 , 2 , 1+	(1.09)	Weak *sr o*	79.86	8 , 15 , 6	1.25	
34.40	1 , 2 , 1—	(1.05)		74.59	1 , 2 , 1	(1.52)	
30.57	1 , 3 , 1	(1.38)		74.15	2 , 2 , 2	(1.83)	Prob. *sr* and *sb o*
27.49	1 , 3 , 1	(1.50)		73.70	2 , 2+ , 1	(1.35)	Prob. *sr o*
26.00	1 , 3 , 1	(1.59)		71.00	2 , 6 , 6	(1.20)	*sb o*
24.75	1 , 4 , 3	(1.22)	*sb o*	70.65	6 , 10 , 4	(1.23)	
24.37	3 , 6 , 2	(1.35)	*sr o*	67.45	1 , 3 , 1	(1.10)	
22.93	1 , 5 , 1	(1.00)		63.84	5 , 15 , 5	1.46	
22.65	1 , 2 , 1	(.98)		62.87	10 , 15 , 10	(1.43)	
20.23	4 , 8 , 4	1.12		59.82	5 , 12 , 5	1.32	
19.54	1— , 2 , 1	(.93)		56.69	10 , 25 , 12	(.60)	*sb o*
18.69	3 , 10 , 4	1.02		56.35	12 , 6 , 4	(.53)	*sr o*
18.34	2 , 8 , 2	(.80)	Diffuse	50.17	12 , 30 , 12	1.30	
16.19	2 , 5 , 3	(1.10)	*sb* either double or a weak line adjacent	42.63	6 , 20 , 4	1.08	
				41.82	3 , 10 , 4	1.12	See 40.42
				38.97	1+ , 3 , 2	1.11	

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TABLE XVII—CONTINUED

λ	i	Δλ/λ²	REMARKS	λ	i	Δλ/λ²	REMARKS
4135.64	1 , 3 , 2	1.19		4073.15	1+ , 2 , 1+	(2.41)	*s*- diffuse
34.27	5 , 15 , 5	1.90		67.78	1 , 2 , 2	(1.98)	
30.44	1 , 2 , 1+	1.11		64.50	1 , 2 , 1	(.74)	
27.60	3 , 8 , 3	1.02		63.59	5 , 10 , 3	1.30	
22.06	1 , 5 , 2	1.27		59.66	3 , 5 , 3	1.29	
18.77	1 , 6 , 2	1.83		57.99	2 , 3 , 2	(1.30)	*sr o*
13.77	1+ , 4 , 2	1.18		57.52	3	(1.53)	*sr* and *sb o*
12.52	2 , 1+ , 2	1.63		57.23	1+ , 2 , 1	(.91)	*s*- broad, *sr o*
11.05	4 , 10 , 3	1.58	*sr* look double in 2d *O*	55.43	1+ , 5 , 1	(1.15)	
				51.10	4 , 8 , 1	(1.33)	Probably *sr o* by 1.30
08 01	1 , 2 , 1	1.34					
06.60	1 , 2 , 1	1.91		48.60	2 , 8 , 2	1.64	
06.14	3 , 10 , 3	1.28		48.18	1 , 3 , 1	(1.50)	
03.90	1 , 4 , 1	(1.16)	*sb o*	43.51	2 , 8 , 4	1.28	*sb o* 3.20
03.41	2 , 6 , 2	(1.42)	*sr o*	39.98	1+ , .. 1+	(1.23)	*sb o*
01.60	1+ , 3 , 1+	1.85		39.53	1+ , 1 , 1	(1.47)	
01.08	8 , 12 , 8	1.23		37.40	2 , 6 , 2	1.08	
4099.13	5 , 12 , 5	1.36		36.71	8 , 15 , 8	.66	
97.93	1+ , .. 1+	(1.35)	Sharp *sb o*	35.10	2 , 4 , 1	(1.73)	
97.52	1+ , 1 , 1+	(1.87)	Diffuse *sr o*	34.36	5 , 10 , 5	1.73	
91.53	3 , 3 , 1+	(1.75)	*sr o*	33.99	1− , 1+ , 1−	(1.16)	
89.35	1 , 3 , 3	(1.35)	*sb o*	32.82	1 , 8 , 5	(1.70)	*sb o sb* of 2.69
88.91	3 , 5 , 1	(1.20)	*sr o*	31.47	2 , 4 , 1+	1.20	
82.49	2 , 8 , 4	(1.01)	*sb o*	30.49	1 , 3 , 1	(.61)	
82.04	4 , 3 , 2	(1.69)	*sr o*	30.00	1 , 2 , 1	(.74)	
81.54	2 , 4 , 2	(1.92)		28.83	4 , 8 , 2	(1.27)	*sr o*
80.47	1 , 2 , 1	(1.04)		27.48	5 , 5 , 4	(1.30)	*sr* and *sb o*
79.77	2 , 2 , 2	1.24		26.30	4 , 12 , 3	(1.21)	*sr o*
74.84	2 , 4 , 2	1 21		25.78	6 , 12 , 7	.97	
73.92	1+ , 8 , 2	1.16		22.23	5 , 12 , 5	1.00	

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
4018.27	1 , 3 , 1	1.35		3972.30	4 , 6 , 4	1.75	
16.02	1+ , 2 , 1+	1.18		69.70	2 , 7 , 2	(1.05)	*sb o*
13.34	1 , 3 , 1	1.20		69.47	2 , 3 , 2	(1.05)	*sr o*
12.67	8 , 20 , 6	1.44		67.37	1 , 2 , 1	(1.70)	
11.95	5 , 12 , 5	1.31		67.10	8 , 5 , 2	(.77)	*sr o* 7.52
09.26	5 , 10 , 5	1.18		66.34	1 , 2 , 1	(.91)	
08.35	2 , 5 , 2	2.09	*s-* are broad	62.49	1 , 5 , 2	1.22	
07.18	15 , 30 , 15	1.24		61.71	1+ , .. , 1+	(1.31)	
06.51	3 , 12 , 3	1.43		60.50	3 , .. , 3	1.37	
05.69	5 , 12 , 5	1.43	*s-* are broad	56.80	2 , .. , 2	.38	These two lines are not separated on *p*-plates, nor by Exner and Hascek.
03.49	6 , 20 , 8	.87		56.70	5 , 1 , 5	.76	
01.88	1+ , 3 , 2	1.16					
00.46	1 , .. , 1+	(1.02)					
00.10	1+ , .. , 1—	(1.18)					
3997.60	.. , 7 , 2	+1.29	*sr o*				
96.20	12 , 20 , 12	1.66		54.57	1 , 2 , 1	(1.11)	
94.70	12 , 30 , 12	.70		51.66	8 , 25 , 8	1.75	
94.49	.. , 3 , 2	+1.08		50.53	8 , 15 , 8	.96	
93.86	1— , .. , 1	(1.10)		49.06	10 , 15 , 8		
92.45	3 , 6 , 3	(1.34)	*sb o*	47.48	2 , 10 , 2	1.26	
92.21	3 , 1 , 2	(1.12)	*sr* and *sb o*	46.30	12 , 15 , ..	—	*o* by 5.96
91.89	2 , 5 , 1	(1.55)		42.20	2 , 7 , 2	1.16	
88.19	7 , 20 , 7	1.10	*sb o*	38.01	6 , 12 , 6	1.08	See quad. 37.14
87.88	.. , 4 , 2	+1.18		36.45	3 , 6 , 4	1.52	
86.81	1+ , 3 , 1+	.89		35.74	3 , 6 , 3	.69	
80.90	.. , 6 , 3	+ .97		35.32	1 , 4 , 1	(1.47)	
80.26	2 , 10 , 3	1.88		33.00	2 , 8 , 3	1.67	
76.56	5 , 15 , 5	1.76	*s-* are broad	32.35	3 , 8 , 5	(.84)	*sb o*
75.36	1+ , 5 , 1+	1.24		32.10	5 , 4 , 1	(.96)	*sr o*
73.36	2 , 8 , 1+	1.33		31.35	1 , 2 , 1—	(1.82)	*s* broad

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3927.54	4 , 10 , 4	1.27		.....	.....	†	
27.24	2 , 8 , 2	2,02		3705.16	2 , 6 , 2	.75	
25.19	5 , 10 , 5	1.30		04.92	— , 1 , 1	+(1.35)	
22.34	2 , 5 , 2	1.47		03.04	3 , 6 , 3	1.32	
21.53	1 , 2 , 2	1.41		....	....	†	
20.41	3 , 15 , 3	(1.91)*	Four lines here	3696.82	2 , 5 , 2	1.09	
19.19	2 , 6 , 3	(1.83)	which overlap.	96.15	5 , 10 , 5	1.08	
18.62	3 , 7 , 2	(1.79)	Three are prob-	92.71	2+ , 6 , 2+	1.18	
18.13	2 , 7 , 8	(1.79)	ably identical	92.24	3 , 5 , 3	(1.09)	*sb o*
16.90	8 , 15 , 8	(1.26)	in separation.	....	....	†	
14.60	1— , 3 , 1	1.52		88.93	10 , 20 , 10	1.50	
13.15	3 , 8 , 3	1.37		88.40	1— , 2 , 1+	(1.12)	*sb o*
11.45	1 , 1 , 1	(1.18)		88.15	1+ , 2 , 4	(1.19)	*sr* and *sb o*
05.44	1 , 1 , 1	1.27		87.13	1+ , 2 , 1	(1.10)	
05.29	8 , 12 , 8	1.42		83.50	1+ , 2 , 1—	(.61)	
04.21	3 , 10 , 3	1.50		82.06	2 , 4 , 2	(2.02)	
00.99	10 , 10 , 8	(1.33)	*sr o* and *sb o*	81.38	1+ , 3 , 1	(.89)	
3898.60	3 , 5 , 2	(1.11)	*sr o*	79.89	12 , 20 , 12	1.72	
93.55	2 , 1 , 2+	(1.84)	*sb o*	.....	....	†	
93.17	2+ , 2 , 2	(1.24)	*sr o*	75.72	8 , 15 , 8	1.12	
91.18	4 , 10 , 4	1.12		73.97	6 , 15 , 6	1.15	
87.54	1+ , 3 , 3	(1.82)	*sb o*	71.72	2 , 4 , 2	1.21	*sr* wide, *sb* sharp
87.08	3 , 6 , 3	(1.29)	*sr o*	70.21	3 , 8 , 5	(1.78)	
86.12	1+ , 2 , 1	(1.29)	*sr o*	68.31	1+ , 4 , 1	(.85)	
84.96	8 , 15 , 8	1.09	*sb* wider than *sr*	63.88	12 , 15 , 12	1.16	
84.67	3 , 5 , 3	1.06		61.74	2 , 7 , 1+	1.05	
.....	....	†		57.70	1— , 2 , 1	(1.06)	
3706.96	6 , 12 , 6	1.52		56.84	1 , 3 , 1—	(1.16)	

*On no-field there are two lines, 0.54 and 0.41, intensities 1 and 4 respectively. Probably run together on *p*-. On *s*- there is a broad doublet symmetrical with 0.41.

†Lines omitted here appear in Table XIX.

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3652.69	5 , 15 , ..	—1.14	*sb o* 2.31 a quad. with same *s*-separation	3624.90	8 , 12 , 3	(1.04)	
				24.12	3 , 6 , 4	1.28	
				19.85	1+ , 3 , 1+	(.82)	
51.72	1 , 3 , 1	(1.52)		18.48	1 , 4 , 1+	(1.31)	
50.95	4 , 10 , 6	1.76		17.22	12 , 15 , 12	(1.19)	*sb* probably *o* by 7.15 and 6.85
49.37	12 , 25 , 12	.85					
48.55	3 , 5 , 3	1.20		16.85	.. , 3 , 1+	+(1.33)	
47.45	3 , 5 , 3	(1.59)	*sr o*	15.47	1 , 2 , ..	—(1.00)	*sb* lost in 5.26
44.84	1+ , 3 , 1+	1.81		14.51	1 , 3 , ..	—(1.27)	*sb* lost in 4.16
44.48	1+ , 4 , 1+	1.37		13.91	.. , 4 , 3	+(1.39)	*sr o* by 4.16
43.62	1 , 4 , 1	1.50		13.02	1 , 2 , 1	(2.63)	
41.74	1 , .. , 1	1.17	*p*- just off end of plate	10.94	2 , 8 , 2	1.43	
				10.55	2 , 8 , 2	1.28	
38.42	1+ , .. , 1+	1.48	*p*- just off end of plate	10.20	3 , 6 , 3	1.53	
				09.60	20 , 25 , 20	1.22	
37.68	2 , 5 , 2	1.66	*p*- broad	09.34	.. , 8 , 3	+ .96	
36.70	1+ , 5 , 1+	1.32		05.78	3 , 8 , 3	1.42	
36.05	5 , 8 , 3	1.03	*sr o* by 6.30	04.17	3 , 8 , 2	1.52	
35.53	3 , 12 , 3	1.22		03.49	2 , 8 , ..	— 1.39	*sb o*
35.40	2 , 8 , 3	1.83		03.32	8 , 15 , 8	1.56	
34.70	4 , 10 , 4	1.08		01.20	10 , 25 , 10	1.20	
34.34	1 , 5 , 1+	.96		3599.86	1+ , 1 , 2+	(1.19)	*sr* and *sb o*
32.94	1 , 5 , 1	(1.20)		99.45	2 , 4 , 2	(1.66)	
32.74	1+ , 4 , 2	1.88		95.72	1 , 3 , 3	(1.06)	*sb o*
29.36	1+ , 3 , 2	1.03		95.40	3 , 5 , 3	(1.53)	*sr* and *sb o*
26.05	6 , 10 , 12	(1.44)	*sb o*	94.20	1 , 2 , 1	1.41	
25.74	12 , 15 , 8	(1.55)	*sr o*	93.96	7 , 10 , 7	1.65	
25.20	2 , 2 , ..	—(1.15)		91.55	1 , 5 , 12	.90	
25.05	3 , 12 , 3	(1.22)	*p*- not isolated from *p*- of 4.90	91.16	3 , 8 , 2	.88	
				88.35	3 , 8 , 3	1.35	

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3585.16	5 , 8 , 3	.96		3550.47	3 , .. , 4	.92	*p- o*
84.28	3 , 5 , 3	1.39		47.60	2 , 4 , 1	(1.23)	
83.16	3 , 5 , 2	1.24		46.41	1 , .. , 2	(1.06)	*p-* not observed
81.57	1 , 1—, 3	(1.18)		46.13	2 , .. , 1	(1.51)	*sr o* 6.41
81.35	3 , 6 , 3	(1.31)		41.80	5 , 8 , 3	1.29	
80.36	4 , 10 , 4	1.75		39.75	12 , 30 , 20	(1.26)	
79.45	10 , 12 , 8	.98		39.37	20 , 15 , 8	(1.26)	
78.27	1+ , 4 , 1+	1.33		38.90	1+ , 6 , 1+	(1.06)	*p-* nearly the width of *s-* separation
77.34	1 , 3 , 1+	.72					
76.68	5 , 8 , 3	1.18					
75.43	12 , 15 , 12	1.07		38.37	1 , 5 , 1	(1.10)	*s-* interior all exposed *s-* very weak compared to *p-*. Same holds for 8.90
73.64	1 , 5 , ..	—(.98)					
73.35	6 , 10 , 4	1.55					
71.70	3 , 6 , 3	1.73					
70.21	1 , 5 , 3	— 1.33					
68.10	2 , 4 , 2	1.81					
67.83	2 , 6 , 2	.92		37.30	8 , 15 , 6	.76	
67.37	2 , 10 , 2	.69		36.80	1+ , 3 , 1	(.95)	
67.16	2 , 8 , 2	1.19		32.08	2 , 10 , 5	(1.11)	*sr o*
65.52	4 , 8 , 4	1.60		31.80	5 , 2 , 2	(1.02)	*sr* and *sb o*
65.24	1 , 1 , 1	(1.19)		31.61	2 , 4 , 1	(1.25)	*sb o*
64.83	4 , 6 , 4	1.16		30.72	1 , 5 , 1	(1.19)	
63.48	1 , 4 , 1	1.18		29.06	10 , 12 , 15	1.18	
61.87	2 , 3 , 2	1.14		22.09	10 , 15 , 10	1.38	
60.95	1 , 3 , 1	.95		15.89	1+ , 3 , 1	1.44	
60.08	8 , 15 , 8	1.13		15.13	2 , 4 , 1	1.46	
55.21	3 , 6 , 2	.94		10.91	1 , 2 , 1	1.20	
53.23	7 , 8 , 7	1.21		10.69	1 , 1 , 1	1.01	
52.03	1 , 3 , 1	(1.08)		07.72	3 , 5 , 2	1.03	
51.55	1 , 5 , 1	(1.34)		07.00	2 , 5 , 2	1.59	

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TABLE XVII—CONTINUED

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
3505.62	5 , 8 , 5	1.20		3473.97	1— , 1 , 1—	(1.45)	
04.20	1— , 3 , 1—	(1.15)		69.50	1+ , 5 , 2	1.48	
03.75	5 , 6 , 3	1.29	Probably *o* by 3.93	68.36	8 , 15 , 10	1.10	
02.94	5 , 10 , 5	1.77		65.17	1 , 3 , 1	(1.83)	
01.61	5 , 8 , 4	1.29		64.58	1 , 3 , 1	(1.14)	
00.45	3 , 3 , 3	1.19		63.86	7 , 15 , 7	(1.21)	
3498.15	3 , 8 , 3	1.43		63.00	10 , 20 , 8	.76	
97.85	3 , 2 , 1	(1.36)	*sr o* by 8.15	61.37	4 , 8 , 3	.97	
97.19	3 , 5 , 2	(1.16)	*sr o* 7.41 which see *sb o* 6.94	61.20	.. , 3 , 1+	+(1.28)	
				55.40	1 , 3 , 1	(1.48)	
96.94	1— , 1 , 1	(1.22)		53.68	1 , 3 , 1	(1.08)	
96.19	1— , 1 , 2	(1.42)	*sb o*	51.85	1+ , .. , 1+	(1.40)	
95.90	2 , 4 , 1	(1.38)	*sr o*	51.13	2 , 3 , 3	(1.33)	*sb o* 0.90
93.70	8 , 15 , 8	1.38		49.42	2 , 5 , 2	1.31	
93.43	1 , 3 , 1	1.14		45.34	5 , 8 , 4	1.30	
91.75	1+ , 3 , 1	1.24		44.15	1+ , 3 , 1+	1.25	
90.67	5 , 8 , 3	(1.56)	*sb o* and weaker	43.25	1 , 2 , 1	(.54)	*s-* are broad
90.42	3 , 5 , 4	(.90)	*sr o* and weaker	42.72	1 , 1+, 1	(1.16)	
88.00	3 , 5 , 2	1.39		41.49	2 , 4 , 2	1.69	
87.15	1 , 4 , ..	—(1.31)	*sb o*	39.83	12 , 25 , 12	1.27	See 41.16 and 39.07
86.67	12 , 25 , 10	1.21	*sr o*	37.42	3 , 10 , 3	1.26	
85.25	4 , 10 , 2	(.91)	*sr o*	37.13	1+ , 4 , 3	1.75	*sb o*
84.25	1+ , 4 , 1+	1.62		36.80	3 , 8 , 3	1.27	*sr o*
79.33	4 , 12 , 4	.66		36.05	15 , 30 , 15	1.51	
78.60	2 , 5 , 2	1.78		34.86	3 , 5 , 3	1.45	
78.28	3 , 8 , 3	1.18		31.95	4 , 8 , 4	1.48	
77.84	1 , 4 , 2	1.76		31.16	1 , 2 , 1	(1.24)	
76.70	5 , 7 , 5	1.14		30.03	4 , 6 , 4	.91	
75.71	1 , 2 , 1	1.14		29.53	3 , 4 , 3	1.18	
74.46	1 , 2 , 1	1.33		29.10	2 , 5 , 3	1.38	

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3426.04	4 , 5 , 3	1.19		3377.57	1 , 3 , 1	1.27	
23.24	3 , 6 , 2	.98		76.98	1+ , 3 , 1+	1.61	
22.75	1+ , 5 , 1+	1.32		75.12	2 , 4 , 1+	1.42	
21.34	8 , 15 , 6	(.98)		74.73	5 , 10 , 3	1.20	
18.89	6 , 12 , 5	.75		73.68	1 , 2 , 1—	1.19	
16.54	1 , 2 , 1	1.52		72.85	2 , 3 , 1	1.30	
16.03	1— , 2 , 1	(1.14)		71.96	6 , 10 , 6	1.30	
13.52	1 , 2 , 1	(2.43)		66.64	10 , 10 , 8	(1.37)	Prob. *sr o* by 6.87
13.15	3 , 5 , 2	1.43		63.20	2 , 4 , 1	1.27	
05.64	2 , 5 , 2	1.21		61.79	3 , 8 , 3	1.24	
04.75	5 , 8 , 5	1.38		60.54	3 , 5 , 5	(1.19)	
03.41	5 , 8 , 3	1.64		60.30	5 , 2 , 1+	(1.31)	
02.81	15 , 25 , 15	1.54		58.74	6 , 12 , 5	.69	
02.16	3 , 7 , 3	1.51		55.69	2 , 4 , 2	1.20	
01.78	1 , 5 , 3	(1.09)	*sr* diffuse	54.76	3 , 6 , 1	(.78)	
3398.70	4 , 8 , 3	1.27		54.35	8 , 12 , 10	1.13	*sb o*
98.02	1+ , 5 , 5	(1.25)	*sb o*	54.10	10 , 3 , 1+	(1.07)	*sr o*
97.65	5 , 8 , 3	(1.42)	*sr o*	51.38	15 , 30 , 15	1.38	
96.87	2 , 8 , 6	1.45	*sb o*	46.68	4 , 6 , 4	1.83	
96.62	6 , 8 , 3	1.39	*sr o*	45.01	3 , 6 , 3	1.10	
94.96	6 , 7 , 4	1.27	Prob. *sr o* by 5.26	43.77	6 , 8 , 4	1.25	
94.27	2 , 4 , 2	1.14		38.54	2 , 6 , 1	.61	See 38.00 6 comps.
93.38	2 , 4 , ..	—(1.10)	*sb o*	33.22	1+ , 3 , 1	1.46	
93.13	.. , 3 , 1+	+(1.07)	*sr o*	32.56	1 , 3 , 1+	1.55	
92.20	20 , 30 , 20	1.54		30.62	3 , 7 , 3	1.60	
90.54	2 , 3 , 1+	1.40		28.40	1— , 1 , 1—	(1.06)	
88.75	2 , 5 , 3	1.50		27.32	2 , 5 , 2	1.41	
85.66	10 , 15 , 10	.96		26.58	1 , 3 , 1	(.98)	
83.27	5 , 10 , 4	1.58		25.27	15 , 25 , 15	1.58	
81.03	1— , 2 , 1	(1.37)		21.57	8 , 15 , 8	1.32	

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TABLE XVII—CONTINUED

λ	*i*	Δλ/λ²	REMARKS	λ	*i*	Δλ/λ²	REMARKS
3320.46	5 , 8 , 4	(1.08)		3265.73	1— , 3 , 1	(1.23)	
17.90	1 , .. , 2	1.31		64.60	1 , 4 , 1	(1.45)	
14.99	5 , 10 , 4	1.78		59.76	1+ , 5 , 1+	(.97)	
13.82	2 , 6 , 2	1.49		56.38	8 , 12 , 8	1.33	
10.35	5 , 7 , 2	1.29	*sr o* by 10.65	55.62	2 , 7 , 2	1.08	
09.25	1+ , 4 , 1+	1.45		54.95	1+ , 4 , 1+	(.91)	
04.33	4 , 8 , 4	1.64		52.85	2 , 3 , 1	(1.25)	*sr o*
01.81	2 , 4 , ..	—(1.48)	*sr* in shadow of 1.44	52.02	1 , 3 , 1—	(1.22)	
				49.02	2 , 2 , 2	1.53	
01.44	6 , 8 , 5	1.25		41.25	.. , 7 , 3	+(1.61)	
00.63	.. , 3 , 1	+(1.00)	*sr o*	39.38	1 , 3 , 1—	(1.18)	
3299.80	1 , 2 , 1	(.99)		38.23	8 , 12 , 8	(1.16)	
97.95	5 , 10 , 4	1.31		35.95	6 , 8 , 6	1.68	
97.47	1+ , 4 , 1+	1.25		33.70	1— , 1— , 1—	(1.63)	
96.72	4 , 8 , 4	1.27		32.16	3 , 2 , 2	1.46	
95.12	.. , 6 , 2	+(.64)		30.98	3 , 5 , 2	1.04	
94.37	2 , 4 , 7	1.63	*sb o*	29.10	8 , 15 , 8	.87	
94.06	7 , 8 , 5	(1.63)	*sr o* and *sb* in shadow of 3.71	27.90	1 , 3 , 1—	1.46	
				26.52	1 , 2 , 3	(2.19)	*sb o*
93 71	.. , 5 , 2	+(1.33)		26.23	3 , 2 , 1	(1.21)	*sr o*
92.62	10 , 20 , 8	1.11		25.80	1 , 2 , 1	(1.37)	
91.88	12 , 30 , 15	1.81		21.40	6 , 12 , 8	1.31	
90.73	3 , 4 , 2	1.07		20.46	1+ , 3 , 1+	1.41	
88.27	2 , 2 , 1	1.48		17.89	1 , 2 , 3	(1.79)	*sb o*
87.90	7 , 12 , 7	1.36		17.61	3 , 4 , 2	(1.02)	*sr o*
83 11	2 , 5 , 1+	1.15		16.67	1 , 3 , 1	(1.49)	
82.75	1+ , 4 , 2	1.15		10.43	3 , .. , 3	1.15	These three lines have diffuse *p*-components
80.52	2 , 5 , 1+	1.06					
75.20	6 , .. , 5	1.83	*p*- is *o*				
69.60	1 , 4 , 1	(1.61)		08.15	2 , .. , 2	1.44	

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TABLE XVII—CONCLUDED

λ	i	$\Delta\lambda/\lambda^2$	REMARKS	λ	i	$\Delta\lambda/\lambda^2$	REMARKS
3207.88	1+ , .. , 1+	(1.74)		3134.50	2 , 4 , 2	1.41	
3198.83	1 , 3 , 3	(1.27)	These four lines give but five components, all of which are sharp, on the *s*-plates	25.60	6 , 12 , 8	(1.46)	
				25.27	8 , 6 , 2	(1.81)	
				23.05	5 , 8 , 4	1.62	
				19.60	8 , 15 , 6	1.12	
				08.37	8 , 15 , 7	1.31	
				05.83	5 , 8 , 4	1.10	
98.57	3 , 4 , 2	(1.48)		01.02	3 , 7 , 3	1.14	
98.33	2 , 2 , 2	(1.30)		3088.54	3 , 5 , 2	1.17	
98.09	3 , 4 , 2	(1.35)		80.31	6 , 8 , 5	1.15	
91.23	1+ , 3 , 1+	(.98)		78.91	4 , 8 , 4	1.16	
88.29	10 , 12 , 8	1.53		72.22	4 , 8 , 3	1.55	
85.05	4 , 7 , 4	1.28		67.81	4 , 10 , 3	.99	
82.80	1 , 2 , 1+	1.71		34.17	1 , 4 , 1	(1.17)	This and subsequent lines measured in second order only
81.33	1+ , 4 , 1+	1.18					
80.35	10 , 20 , 10	1.17					
79.18	5 , 8 , 5	1.02					
75.84	6 , 10 , 4	1.11					
69.43	1 , 2 , 1	(1.90)		2988.33	1+ , 5 , 1+	.83	
67.66	1— , 3 , 1—	(1.22)		42.97	2 , 5 , 2	1.61	
66.92	1+ , 2 , 1+	(1.12)		28.30	1 , 3 , 1	(1.34)	Many weak triplets are visible as far as 2750. But other types are not present
65.94	1+ , 2 , 1+	1.62					
64.60	1— , 3 , 1	(1.24)					
62.95	1 , 3 , 1+	(1.39)					
54.89	6 , 8 , 6	.85					
54.40	3 , 6 , 2	1.27		25.06	1 , 5 , 1	(1.21)	
51.74	1— , 3 , 1—	(1.23)		2887.90	2 , 5 , 2	1.23	
42.95	5 , 7 , 4	1.21		85.13	2 , 4 , 1+	1.09	
41.95	1+ , 4 , 1+	(1.50)		84.38	1+ , 3 , 1+	(1.02)	
39.38	5 , 8 , 5	1.67	*s*- are broad				

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TABLE XVIII

λ 4107.58		λ 4112.95		λ 4110.72	
i	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$	*i*	$\Delta\lambda/\lambda^2$
2.....	—(1.16) *s*	1.....	—(1.15) *s*	2.....	—1.24 *s*
4.....	—(.12) *p*	3.....	+(.13) *p*	8.....	+ .27 *p*
2	+(1.16) *s*	1.....	+(1.15) *s*	3.....	+1.87 *s*

λ 3294.76	
i	$\Delta\lambda/\lambda^2$
1+....	—(.77) *p*
2.....	0 00 *s*
2.....	+(.77) *p*

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TABLE XIX

λ	Intensities			Δλ/λ²						Remarks
	No-f	s-	p-	s-			p-			
3875.85	2	1, 4		−2.10	....	+1.07	....	....	....	Probably *s r o*, then unsym.
75.56	2	3, 2		1.26	....	.26	....	....	....	
						.88	....	....	....	
75.00	8	2, 8	20	1.37	....	1.00	....	o	....	
74.35	3	1, 5—	6	1.35	....	.66	— .23	....	....	
73.94	10	4, 3	15	....	±1.04	....	....	o	....	
73.56	3	2, 1	5, 1	.66	....	1.30	.31	....	+ .96	Quadruplet unsymmetrical
72.87	10	10, 12	20	....	1.30	....	....	o	....	
72.51	..	3	1	....	....	1.32	....	o	....	*s r o* symmetrical
..	..	..	5	....	?	....	....	±1.15	....	
70.30	1	6	4	.23	....	....	....	o	....	
70.13	2	3	3	....	....	.23	....	o	....	
69.85	1	5	7	....	o	....	....	o	....	
69.54	2	5	5	.26	....	....	....	o	....	
68.23	1	3	2	....	o	....	....	o	...	
68.13	3	..	2	....	....	....	....	o	...	
68.04	2	3	3	.23	....	....	....	....	.53	
67.77	2	3	3	.69	...	...	.60	....	....	
67.42	1	1	3, 1+	....	.38	....	.42	....	1.32	
67.02	8	6, 5	7	1.02	....	.52	....	o	....	
66.63	1—	2	2	....	o	....	....	o	....	
66.21	4	7, 3	3, 6	....	....	....	....	....	....	Quadruplet unsymmetrical
65.72	1	2	2	....	o	....	....	o	....	
65.54	..	1	2	....	o	....	....	o	....	
65.33	1	4	..	....	o	....	....	....	....	
65.14	1	..	..	....	....	....	....	....	....	
65.00	..	1	1—	....	o	....	....	o	....	
64.67	1	8	6	....	o	...	....	o	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3864.47	2	3	3	....	0	....	....	0	....	
64.27	1	3	2	....	0	....	....	0	....	
63.54	15	15, 10	10, 20	— .93	....	+1.55	— .13	....	0	*p*, broad
62.52	6	7, 3	15	....	± .75	....	....	0	....	Probably *sr o*
61.86	1	5	4	....	0	....	....	0	....	
61.69	5	5	12	....	0	....	....	0	....	
61.28	1—	1	2	....	0	....	....	0	....	
60.96	1—	1+	2	....	0	....	....	0	....	
60.76	2	5	7	....	0	....	....	0	....	
59.98	25	..	..	....	....	....	....	....	....	Quadruplet symmetrical
59.43	1	2	3	....	0	....	....	0	....	
59.03	2	2	2	....	0	....	....	0	....	
58.30	..	1	1	....	0	....	....	0	....	
57.98	1	2	2	....	0	....	....	0	....	
57 77	1	2	2	....	0	....	....	0	....	
57.57	1+	1—	2	....	0	....	....	0	....	
57.47	1	..	..	....	....	....	....	....	....	
57.37	..	..	..	....	....	....	....	....	....	No-f, *p* and *s* look double
57.21	1	4	3	....	0	....	....	0	....	
57.02	1—	1	1—	....	0	....	....	0	....	
56.77	3	5	5	....	0	....	....	0	....	
56.45	4	5	2	....	0	....	....	0	....	
56.23	1	..	..	....	....	....	....	....	....	
55.90	1	3	2	....	0	....	....	0	....	
55.73	1	5	6	....	0	....	....	0	....	
55.47	..	1	1	....	0	....	....	0	....	
55.13	..	..	1	....	0	....	....	0	....	
54.97	3	2	8	....	0	....	....	0	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3854.61	25	15, 12	25	−1.08	....	+1.78	....	0	....	
54.21	1—	1	1+	....	0	....	....	0	....	
53.95	1	1	1	....	0	....	....	0	....	
53.60	2	5	6	....	0	....	....	0	....	
53.07	3	2	5	....	±1.59	....	....	0	....	
52.88	1—	..	2	....	....	....	....	0	....	
52.59	2	5	7	....	0	....	....	0	....	
52.27	4	1	3	....	0	....	....	0	....	
52.00	1—	1—	1—	....	0	....	....	0	....	
51.72	1+	3	3	....	0	....	....	0	....	
51.36	2	2	4	....	0	....	....	0	....	
51.24	2	1	..	....	0	....	....	....	....	
51.09	1	2	..	....	0	....	....	....	....	
50.93	2	2	..	....	0	....	....	....	....	
50.74	1	1—	..	....	0	....	....	....	....	
50.56	1	1	..	....	0	....	....	....	....	
50.39	1	1	3	....	0	....	....	0	....	
50.23	5	3	10	....	0	....	....	0	....	
50.06	1	3	2	....	0	....	....	0	....	
49.83	1	2	2	....	0	....	....	0	....	
49.43	1	5	3	....	0	....	....	0	....	
49.07	2	8	12	....	0	....	....	0	....	
48.93	1—	1	3	....	0	....	....	0	....	
48.73	1	2	1, 1	....	0	....	....	....	....	*p*- is doublet
48.34	1—	2	2	....	0	....	....	0	....	
48.02	2	6	6	....	0	....	....	0	....	
47.43	..	2	2	....	0	....	....	0	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			$\Delta\lambda/\lambda^2$						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3847.16	..	..	..	....	....	....	....	....	....	Not on no-f; mixed with 7.02; latter unsymmetrical
47.02	..	..	..	....	....	....	....	....	....	
46.40	2	6	8	....	±1.20	....	....	0	....	
46.16	1	..	2	....	....	....	....	0	....	
45.68	3	8	8	....	0	....	....	0	....	
45.16	2	6	6	....	0	....	....	0	....	
44.81	..	1	1	....	0	....	....	0	....	
44.37	3	8	7	....	0	....	....	0	....	
44.18	1	2	2	....	0	....	....	0	....	
43.57	2	2	3	....	0	....	....	0	....	
43.09	6	8	12	— .19	....	....	....	....	+. 19	Quadruplet unsymmetrical
42.69	..	..	..	....	....	....	....	....	....	5 components symmetrical
42.10	..	..	..	....	....	....	....	....	...	
41.87	1	..	3	....	....	....	....	0	....	
41.14	1—	1—	4	....	0	....	....	0	....	
40.99	3	..	1	....	....	....	....	0	....	
40.61	3	6	7	....	0	....	....	0	....	
39.90	15	15	30	....	±1.38	....	....	0	....	Triplet symmetrical
39.56	2	?	3	....	±1.60	....	....	0	....	Triplet symmetrical
39.33	2	7	5	....	0	....	....	0	....	
38.87	1	..	2, 2	....	....	....	— .39	....	+ .24	Exner's line is 8.92, agreeing with *pr*
38.49	1	2	2	....	0	....	....	0	....	
38.01	?	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
37.76	1	3	2	....	0	....	....	0	....	
37.50	1	2	2	....	0	....	....	0	....	
36.65	10	3, 10	15	—1.30	....	+ .66	....	0	....	
36.19	1	2	1	....	0	....	....	0	....	

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TABLE XIX -CONTINUED

λ	Intensities			Δλ/λ²						Remarks
	No-f	s-	p-		s-			p-		
3836.08	1 -	1	1	....	0	....	....	0	....	
35.83	1	2	1	....	0	....	....	0	....	
35.45	3	3	3	....	0	....	....	0	....	
35.21	2	5	5	....	0	....	....	0	....	
34.60	1	2	1 +	....	0	....	....	....	+ .48	
34.27	2	2	4	....	0	....	....	0	....	
33.83	2	6	4	....	0	....	....	0	....	
33.10	3	..	6	....	....	....	....	0	....	
32.87	..	..	..	....	....	....	....	....	....	Quadruplet weak
32.59	2	4	5	....	0	....	....	0	....	
31.90	10	8, 5	20	.86	....	1.64	....	0	....	
31.12	2	1	3, ..	....	0	....	.63	....	....	
30.93	5	5	7	....	+ 1.64	....	....	0	....	
30.70	..	..	..	....	....	....	....	....	....	Quadruplet
30.27	3	1	2	....	0	....	....	0	..	
30.05	1	..	1	....	....	....	....	0	....	
29.81	1 +	4	3	.27	....	....	....	0	....	
29.61	4	5	7	....	0	....	....	0	....	
28.58	5	..	..	....	....	....	....	....	....	6 components unsymmetrical
28.30	1	..	..	....	....	....	....	....	....	
27.92	1—	1	1 - -	....	0	....	....	0	....	
27.69	..	..	2	....	....	....	....	0	....	p- possibly doublet
27.46	..	..	2	....	....	....	....	0	....	
27.07	..	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
26.86	1+	5	3	....	0	....	....	0	....	
26.44	3	.., 4	.., 2	....	....	1.60	....	....	.52	No s-components found
26.10	2	..	2	....	....	....	....	0	....	
25.87	1	4	2	....	0	....	....	0	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3825.44	1	..	2	....	o	....	....	o	....	
25.33	2	2, 1	3	....	±1.08	....	....	o	....	
25.25	3	2+, 2	8	....	1.08	....	....	o	....	
24.96	1—	..	2	....	....	....	....	o	....	
24.70	1—	..	2	....	....	....	....	o	....	
24.52	1	5	2	....	o	....	....	o	....	
24.26	1	1	1	....	o	....	....	o	...	
23.99	1	2	4	....	o	....	....	o	....	
23.76	3	.., 4	8	....	....	....	....	o	....	*sr o*, therefore unsymmetrical
23.47	1	..	4	....	....	....	....	o	....	
23.22	3	5	1	....	o	....	....	o	....	
23.06	2	1	3	....	o	....	....	o	....	
22.46	1	..	6	....	....	....	....	o	....	
22.33	..	..	..	....	....	....	....	....	....	5 components unsymmetrical
21.92	2	4	3	....	o	....	....	o	....	*p*- possibly doublet
21.57	..	..	..	....	....	....	....	....	....	Quadruplet symmetrical
20.92	4	4	6	....	o	....	....	o	....	
20.54	2	2	6	....	.88	....	....	o	....	
20.09	2	1—, 2	3	— .93	....	+ .69	....	o	....	*sr* sharp, *sb dr* broad, *p*- diffuse
19.44	2	2, 6	6	.82	....	.55	....	....	+ .22	
19.25	1	1—, 3	3	1.07	....	.43	....	o	....	
18.81	2	1+	2	....	o	...	....	o	....	
18.33	1	1+	2	....	o	....	....	o	....	*p*- *db* no-f broad, diffuse
17.82	1	8	5	....	o	....	....	o	....	
17.64	3	1—	2	....	o	....	....	o	....	
17.51	2	8, 1, 1, 4	8	....	....	....	....	o	....	*sb* at distance 2.05 which makes *sr* coincide with 7.82; for inner pair *sr* falls on 7.64

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	s-	p-	s-			p-			
3836.08	1—	1	1—	....	0	....	....	0	....	
35.83	1	2	1	....	0	....	....	0	....	
35.45	3	3	3	....	0	....	....	0	....	
35.21	2	5	5	....	0	....	....	0	....	
34.60	1—	2	1+	....	0	....	....	....	+ .48	
34.27	2	2	4	....	0	....	....	0	....	
33.83	2	6	4	....	0	....	....	0	....	
33.10	3	..	6	....	....	....	....	0	....	
32.87	..	..	..	....	....	....	....	....	....	Quadruplet weak
32.59	2	4	5	....	0	....	....	0	....	
31.90	10	8, 5	20	.86	....	1.62	....	0	....	
31.12	2	1—	3, ..	....	0	....	— .63	....	....	
30.93	5	5	7	....	±1.64	....	....	0	....	
30.70	..	..	..	....	....	....	....	....	....	Quadruplet
30.27	3	1—	2	....	0	....	....	0	....	
30.05	1	..	1—	....	....	....	....	0	....	
29.81	1+	4	3	.27	....	....	....	0	....	
29.61	4	5	7	....	0	....	....	0	....	
28.58	5	..	..	....	....	....	....	....	....	6 components unsymmetrical
28.30	1	..	..	...	....	....	....	....	. ..	
27.92	1—	1	1—	....	0	....	....	0	....	
27.69	..	..	2	....	....	....	....	0	....	p- possibly doublet
27.46	..	..	2	....	....	....	....	0	....	
27.07	..	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
26.86	1+	5	3	....	0	....	....	0	....	
26.44	3	.., 4	.., 2	....	....	1.60	....	....	.52	No r-components found
26.10	2	..	2	....	....	....	....	0	....	
25.87	1	4	2	....	0	....	....	0	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3825.44	1	..	2	....	0	....	....	0	....	
25.33	2	2, 1	3	....	±1.08	....	....	0	....	
25.25	3	2+, 2	8	....	1.08	....	....	0	....	
24.96	1—	..	2	....	....	....	....	0	....	
24.70	1—	..	2	....	....	....	....	0	....	
24.52	1	5	2	....	0	....	....	0	....	
24.26	1	1	1	....	0	....	....	0	...	
23.99	1	2	4	....	0	....	....	0	....	
23.76	3	.., 4	8	....	....	....	....	0	....	*sr o*, therefore unsymmetrical
23.47	1	..	4	....	....	....	....	0	....	
23.22	3	5	1	....	0	....	....	0	....	
23.06	2	1	3	....	0	....	....	0	....	
22.46	1	..	6	....	....	....	....	0	....	
22.33	..	..	..	....	....	....	....	....	....	5 components unsymmetrical
21.92	2	4	3	....	0	....	....	0	....	*p*- possibly doublet
21.57	..	..	..	....	....	....	....	....	....	Quadruplet symmetrical
20.92	4	4	6	....	0	....	....	0	....	
20.54	2	2	6	....	.88	....	....	0	....	
20.09	2	1—, 2	3	— .93	....	+ .69	....	0	....	*sr* sharp, *sb dr* broad, *p*- diffuse
19.44	2	2, 6	6	.82	....	.55	....	....	+ .22	
19.25	1	1—, 3	3	1.07	....	.43	....	0	....	
18.81	2	1+	2	....	0	...	....	0	....	
18.33	1	1+	2	....	0	....	....	0	....	*p- db* no-f broad, diffuse
17.82	1	8	5	....	0	....	....	0	....	
17.64	3	1—	2	....	0	....	....	0	....	
17.51	2	8, 1, 1, 4	8	....	....	....	....	0	....	*sb* at distance 2.05 which makes *sr* coincide with 7.82; for inner pair *sr* falls on 7.64

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3817.25	1	3	..	....	o	....	....	o	....	
17.12	..	1	1	....	o	....	....	o	....	Not present on no-f and *s*- and *p*-
16.96	1	..	..	....	....	....	....	....	....	not present for next line. Are these then all one line?
16.70	2	1	4	....	o	....	....	o	....	
16.29	3	6	8	....	o	....	....	o	....	
15.95	..	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
15.68	3	.., 3	.., 2	....	....	+1.03	....	....	+ .76	If *r*-components are present they are too weak or overlap 5.95 and then unsymmetrical
15.16	5	2, 5	8	— .92	....	.43	....	o	....	*sb* falls on 4.99
14.99	1	5?	3	....	o	....	....	o	....	
14.87	2	..	7	....	o	....	....	o	....	*s* probably double, *o* 4.99 and 4.73
14.73	1	5	7	....	o	....	....	o	....	
14.12	2	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
14.08	2	3	2	....	o	....	....	± .67	....	Triplet with null *s*-
13.79	4	.., 1	3, 1	....	....	....	....	....	....	Quadruplet unsymmetrical
13.52	1	3, ..	1	.85	....	....	....	o	....	
13.21	20	15	30	....	±1.17	....	....	o	....	Triplet symmetrical
12.52	2	1—, 1—	2	....	....	....	....	o	....	Triplet symmetrical
12.16	1—	2	2	....	o	....	....	o	....	
11.79	2	5	5	....	o	....	....	o	....	
11.50	3	4	8	....	o	....	....	o	....	
11.10	5	1	5	....	....	....	....	o	....	Possibly *s*- is triplet, as a weak line to *r* is present
10.83	1	3, ..	1	— .87	....	....	— .20	....	....	
10.70	2	2	3	....	o	....	....	....	.17	
10.00	8	5, 8	20	1.71	....	.84	....	o	....	No-f line double

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TABLE XIX– CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3809.62	1—	1	1	....	0	....	....	0	....	
09.28	2	3	3	....	0	....	....	0	....	
08.80	1—	1+	1+	— .31	....	....	....	....	+ .26	*p* very broad. Probably 2 or 3 comps. A *p*-comp. in position 8.30
08.43	1—	1	1	....	± .57	....	....	0	....	*s*- *d* inside, *d* outside. *p*- has pos. an external pair of components
08.04	5	15	8	....	1.55	....	....	0	....	
07.38	2	2+	3	....	0	....	....	0	....	
06.96	2	5	4	....	0	....	....	0	....	
06.48	7	5	3	....	0	....	....	0	....	
06.25	1	5	..	....	0	....	....	0	....	*p*- *o pr* of 6.12, therefore displaced to blue
06.12	6	5	8, 4	....	0	....	—.66	....	.86	*p*- called a doublet *o* 6.25 and 5.95
05.95	2	8	4	....	0	....	....	0	...	
05.73	5	4	1	....	0	....	....	0	....	
05.55	3	1, 1—	5	....	1.18	....	....	0	....	Triplet symmetrical
05.18	2	1—, 1—	2	....	1.93	....	....	0	....	Triplet symmetrical
04.85	3	..	6	....	....	....	....	0	....	
04.34	1	2	2	....	0	....	....	0	....	Blurred with next line on *p*- plate
04.19	2	..	2	....	....	....	....	0	....	*s*- absent and taken as a doublet *o* 4.34 and 4.01
04.11	1	2	..	....	0	....	....	....	....	
03.25	8	5, 3	12	....	.84	....	....	0	....	*s*- probably unsymmetrical, but no-f line not sharp enough to make the measurement
03.93	1—	2	1	....	0	....	....	0	....	Quadruplet symmetrical *p*=*s*
02.65	1	1, 1	1, 1	....	....	....	....	....	....	
02.31	3	..	..	....	....	....	....	....	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3836.08	1—	1	1—	....	0	....	....	0	....	
35.83	1	2	1	....	0	....	....	0	....	
35.45	3	3	3	....	0	....	....	0	....	
35.21	2	5	5	....	0	....	....	0	....	
34.60	1—	2	1+	....	0	....	....	....	+ .48	
34.27	2	2	4	....	0	....	....	0	....	
33.83	2	6	4	....	0	....	....	0	....	
33.10	3	..	6	....	....	....	....	0	....	
32.87	..	..	..	....	....	....	....	....	....	Quadruplet weak
32.59	2	4	5	....	0	....	....	0	....	
31.90	10	8, 5	20	.86	....	1.62	....	0	....	
31.12	2	1—	3, ..	....	0	....	— .63	....	....	
30.93	5	5	7	....	±1.64	....	....	0	....	
30.70	..	..	..	....	....	....	....	....	....	Quadruplet
30.27	3	1—	2	....	0	....	....	0	....	
30.05	1	..	1—	....	....	....	....	0	....	
29.81	1+	4	3	.27	....	....	....	0	....	
29.61	4	5	7	....	0	....	....	0	....	
28.58	5	..	..	....	....	....	....	....	....	6 components unsymmetrical
28.30	1	..	..	....	....	....	....	....	....	
27.92	1—	1	1—	....	0	....	....	0	....	
27.69	..	..	2	....	....	....	....	0	....	*p*- possibly doublet
27.46	..	..	2	....	....	....	....	0	....	
27.07	..	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
26.86	1+	5	3	....	0	....	....	0	....	
26.44	3	.., 4	.., 2	....	....	1.60	....	....	.52	No *r*-components found
26.10	2	..	2	....	....	....	....	0	....	
25.87	1	4	2	....	0	....	....	0	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3825.44	1	..	2	....	o	....	....	o	....	
25.33	2	2, 1	3	....	±1.08	....	....	o	....	
25.25	3	2+, 2	8	....	1.08	....	....	o	....	
24.96	1—	..	2	....	....	....	....	o	....	
24.70	1—	..	2	....	....	....	....	o	....	
24.52	1	5	2	....	o	....	....	o	....	
24.26	1	1	1	....	o	....	....	o	...	
23.99	1	2	4	....	o	....	....	o	....	
23.76	3	.., 4	8	....	....	....	....	o	....	*sr o*, therefore unsymmetrical
23.47	1	..	4	....	....	....	....	o	....	
23.22	3	5	1	....	o	....	....	o	....	
23.06	2	1	3	....	o	....	....	o	....	
22.46	1	..	6	....	....	....	....	o	....	
22.33	..	..	..	....	....	....	....	....	....	5 components unsymmetrical
21.92	2	4	3	....	o	....	....	o	....	*p*- possibly doublet
21.57	..	..	..	....	....	....	....	....	....	Quadruplet symmetrical
20.92	4	4	6	....	o	....	....	o	....	
20.54	2	2	6	....	.88	....	....	o	....	
20.09	2	1—, 2	3	— .93	....	+ .69	....	o	....	*sr* sharp, *sb dr* broad, *p*- diffuse
19.44	2	2, 6	6	.82	....	.55	....	....	+ .22	
19.25	1	1—, 3	3	1.07	....	.43	....	o	....	
18.81	2	1+	2	....	o	...	....	o	....	
18.33	1	1+	2	....	o	....	....	o	....	*p*- *db* no-f broad, diffuse
17.82	1	8	5	....	o	....	....	o	....	
17.64	3	1—	2	....	o	....	....	o	....	
17.51	2	8, 1, 1, 4	8	....	....	....	....	o	....	*sb* at distance 2.05 which makes *sr* coincide with 7.82; for inner pair *sr* falls on 7.64

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TABLE XIX—CONTINUED

λ	Intensities			Δλ/λ²						Remarks
	No-f	*s*-	*p*-	*s*-			*p*-			
3817.25	1	3	..	....	o	....	....	o	....	
17.12	..	1	1	....	o	....	....	o	....	Not present on no-f and *s*- and *p*- not present for next line. Are these then all one line?
16.96	1	..	..	....	....	....	....	....	....	
16.70	2	1	4	....	o	....	....	o	....	
16.29	3	6	8	....	o	....	....	o	....	
15.95	..	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
15.68	3	.., 3	.., 2	....	....	+1.03	....	....	+ .76	If *r*-components are present they are too weak or overlap 5.95 and then unsymmetrical
15.16	5	2, 5	8	— .92	....	.43	....	o	....	*sb* falls on 4.99
14.99	1	5?	3	....	o	....	....	o	....	
14.87	2	..	7	....	o	....	....	o	....	*s* probably double, *o* 4.99 and 4.73
14.73	1	5	7	....	o	....	....	o	....	
14.12	2	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
14.08	2	3	2	....	o	....	....	± .67	....	Triplet with null *s*-
13.79	4	.., 1	3, 1	....	....	....	....	....	....	Quadruplet unsymmetrical
13.52	1	3, ..	1	.85	....	....	....	o	....	
13.21	20	15	30	....	±1.17	....	....	o	....	Triplet symmetrical
12.52	2	1—, 1—	2	....	....	....	....	o	....	Triplet symmetrical
12.16	1—	2	2	....	o	....	....	o	....	
11.79	2	5	5	....	o	....	....	o	....	
11.50	3	4	8	....	o	....	....	o	....	
11.10	5	1	5	....	....	....	....	o	....	Possibly *s*- is triplet, as a weak line to *r* is present
10.83	1	3, ..	1	— .87	....	....	— .20	....	....	
10.70	2	2	3	....	o	....	....	....	.17	
10.00	8	5, 8	20	1.71	....	.84	....	o	....	No-f line double

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TABLE XIX– CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3809.62	1—	1	1	....	0	....	....	0	....	
09.28	2	3	3	....	0	....	....	0	....	
08.80	1—	1+	1+	— .31	....	....	....	....	+ .26	
08.43	1—	1	1	....	± .57	....	....	0	....	*p* very broad. Probably 2 or 3 comps. A *p*-comp. in position 8.30
08.04	5	15	8	....	1.55	....	....	0	....	*s*- *d* inside, *d* outside. *p*- has pos. an external pair of components
07.38	2	2+	3	....	0	....	....	0	....	
06.96	2	5	4	....	0	....	....	0	....	
06.48	7	5	3	....	0	....	....	0	....	
06.25	1	5	..	....	0	....	....	0	....	*p*- *o pr* of 6.12, therefore displaced to blue
06.12	6	5	8, 4	....	0	....	—.66	....	.86	*p*- called a doublet *o* 6.25 and 5.95
05.95	2	8	4	....	0	....	....	0	...	
05.73	5	4	1	....	0	....	....	0	....	
05.55	3	1, 1—	5	....	1.18	....	....	0	....	Triplet symmetrical
05.18	2	1—, 1—	2	....	1.93	....	....	0	....	Triplet symmetrical
04.85	3	..	6	....	....	....	....	0	....	
04.34	1	2	2	....	0	....	....	0	....	Blurred with next line on *p*- plate
04.19	2	..	2	....	....	....	....	0	....	*s*- absent and taken as a doublet *o* 4.34 and 4.01
04.11	1	2	..	....	0	....	....	....	....	
03.25	8	5, 3	12	....	.84	....	....	0	....	*s*- probably unsymmetrical, but no-f line not sharp enough to make the measurement
03.93	1—	2	1	....	0	....	....	0	....	
02.65	1	1, 1	1, 1	....	....	....	....	....	....	Quadruplet symmetrical *p*=*s*
02.31	3	..	..	....	....	....	....	....	....	

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3802.10	2	3	3	....	0	....	....	0	....	
01.75	2	3	4	....	0	....	....	0	....	
01.61	3	2, 5	6	—1.28	....	+ .64	....	....	+ .37	*p*- is blurred with an adjacent *b* line. The latter symmetrical with no-f line 1.53
01.53	1	..	1	....	....	....	....	0	....	
00.80	3	4, ..	6	1.20	....	....	....	0	....	
00.53	4	..	5	....	....	....	....	0	....	*p*- diffuse, possibly doublet. No *s*- visible. If *sr o* 0.80 then *sb* should be visible
00.37	2	..	..	....	....	....	...	....	....	
00.23	1—	3	4	....	....	1.48	....	0	....	
3799.79	1	5	2	....	0	....	— .20	....	....	Exposure from this line past the next two on *p*- plate
99.65	1—	..	..	....	....	....	....	....	....	
99.36	1	..	1+	....	....	....	....	0	....	
98.77	1—	3	1—	....	0	....	....	0	....	
98.66	2	5	2	....	0	..	....	0	....	
98.25	3	2	6	1.45	....	1.82	....	0	....	
98.12	1—	..	3	....	....	....	....	0	....	
97.66	3	2, 5	8	1.41	....	2.25	....	0	....	*sb* is here assumed to *o* 7.37
97.37	2	5	1	....	0	....	....	0	....	
97.13	1—	4	4	....	0	....	....	0	....	
96.85	3	.., 1	1+	....	....	1.50	....	0	....	If *sr o* 7.13, then its sep. =2.37 approx.
96.33	1	3	3	....	0	....	....	0	....	
95.90	1—	1+	1+	....	0	....	....	0	....	
95.53	3	2, 5	5	1.09	....	.74	....	0	....	

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TABLE XIX--CONTINUED

λ	Intensities			Δλ/λ²						Remarks
	No-f	*s*-	*p*-	*s*-			*p*-			
3795.20	1—	1	1	....	0	....	....	0	....	
94.85	3	1—, 1	1	....	±1.20	....	....	0	....	*p*- broad, possibly doub. or triplet
94.50	2	5	4	— .48	....	....	— .47	....	....	
94.30	4	4	8	....	1.05	....	....	0	....	Triplet symmetrical
93.95	2	..	3	....	(1.20)	....	....	0	....	*s*- components *o*
93.65	2	..	3	....	(1.46)	....	....	0	....	*s*- components *o*
93.28	1	1—	1—	....	0	....	....	0	....	
93.11	1—	1—	2	....	0	....	....	0	....	
92.88	2	.., 2	2	....	....	+1.18	....	0	....	
92.52	6	..	..	....	....	....	....	....	....	7 components symmetrical
92.15	2	.., 1	3	....	....	1.50	....	0	....	
91.66	1—	..	..	....	....	....	....	....	....	
91.50	5	6, 4	10	....	1.06	....	....	0	....	*p dr*, *sr o* symmetrical; *s*- has diffuse background
90.99	8	6	10	....	0	....	....	0	....	
90.67	1—	1—	2	....	0	....	....	0	....	
90.51	3	2, 2	2	....	1.27	....	....	0	....	
90.26	2	2, 5	6	....	.84	...	....	0	....	*sb o* 90.10; *p*- possibly doublet
90.10	1	5, 1+	.., 2	....	....	....	....	....	....	Quadruplet unsymmetrical
89.29	15	15, 20	25	....	1.30	....	....	0	....	*s*- too broad to measure for dissymmetry
88.66	1—	1	2	....	0	....	....	0	....	No-f diffuse, *s* and *p*- are sharp
88.54	3	1+, 1	1	....	1.15	....	....	0	....	*p*- diffuse; others sharp
87.80	1—	1	1—	....	0	....	....	0	....	
87.65	1	..	2	....	0	....	....	0	....	
87.34	2	7	7	....	0	...	....	0	....	No-f broad
87.04	3	1, 2	8	1.42	....	1.13	....	0	....	
86.12	3	3, ..	8	1.32	....	....	....	0	....	*sb o*

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3785.80	15	..	..	....	....	....	....	....	....	Quadruplet
85.50	1	..	..	....	....	....	....	....	....	
84.74	1	1—, 1	1+	....	....	....	....	o	....	
83.95	1	3	3	....	o	....	....	o	....	No-f diffuse
83.83	2	..	5	....	....	....	....	o	....	Region covering this and next two lines all exposed on *s*- plate
83.68	1—	..	..	....	....	....	....	o	....	
83.48	5	..	2	....	....	....	....	o	....	*p*- broad enough for three lines
83.15	5	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
82.35	1	2	1	....	o	....	....	o	....	
81.83	1—	5	3	....	o	....	....	o	....	
81.50	2	1, 1+	1—	— .97	....	+1.77	....	o	....	*sb o*
81.43	3	1+, 2	3	1.06	....	1.58	....	o	....	
80.65	1—	3	3	....	o	....	....	o	....	
79.95	1	5	3	....	o	....	....	o	....	
78.98	2	6	6	....	o	....	....	o	....	No-f is sharp; *p*- and *s*- are fuzzy
78.00	1	3, 1	2, 1	....	....	....	....	....	....	Quadruplet unsymmetrical
77.60	1	1+	1—	....	o	....	....	o	....	
77.27	1—	3	1	....	o	....	....	o	....	
76.80	1	1—, 1	1+	....	....	....	....	o	....	
76.43	4	2	3	....	±1.21	....	....	o	....	Triplet symmetrical
76.10	3	..	..	....	....	...	....	....	....	Quadruplet unsymmetrical
75.47	1	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
74.88	2	1—, 1—	1	....	....	....	....	o	....	Triplet too weak
74.40	5	6	12	....	1.12	....	....	o	....	
73.94	8	6, 8	15	....	....	....	....	....	....	Quadruplet symmetrical
73.23	1	2	3	....	1.21	....	....	o	....	Triplet symmetrical
72.83	1+	..	1	....	....	....	....	o	....	

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TABLE XIX—CONTINUED

λ	Intensities			$\Delta\lambda/\lambda^2$						Remarks
	No-f	*s*-	*p*-	*s*-			*p*-			
3772.41	3	5, 3	6	— .94	....	+1.86	....	o	....	
71.80	2	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
71.55	8	3	6	....	±1.67	....	....	o	....	Triplet symmetrical
70.40	1—	..	..	....	....	...	....	....	....	
70.25	8	..	..	....	....	....	....	....	....	Quadruplet unsymmetrical
69.80	2	2, 1+	1	1.09	....	1.20	....	o	....	
68.62	2	3, 4	5	1.20	....	1.49	....	o	....	
68.05	12	6, 8	25	....	1.22	....	....	o	....	Triplet symmetrical
67.69	1—	..	1	....	....	....	....	o	....	
67.39	3	3	6	....	o	....	....	o	....	
66.65	1+	1—	1+	....	o	....	....	o	....	
65.57	1	6	2, ..	....	o	....	—1.03	....	....	*pb* lost in next line or too weak, probably unsymmetrical
65.43	8	3	12	....	1.25	....	....	o	....	Symmetrical triplet
64.80	1—	.. ..	1	....	....	....	....	o	....	There are two weak *sr* lines and no *sb* lines. These two may belong to another line.
64.48	1—	3	1+	....	o	...	....	o	....	
64.26	1	..	1	....	....	....	....	....	....	
64.01	1	1	1	.81	....	.98	....	o	....	
63.75	1+	1, 1—	3	1.22	....	....	....	o	....	
63.49	3	3	3	.98	....	....	....	o	....	*s*- sharp, *p*- broad, *sb* not found
63.04	15	15	20	....	....	....	....	....	....	Quadruplet symmetrical
62.50	1—	2	2	....	o	....	....	o	....	
62.05	1—	..	1—	....	....	....	....	o	....	
61.91	1	..	..	....	....	....	....	....	....	
61.69	4	1—	3	....	....	....	....	o	....	
61.50	1	4	2	....	o	....	....	o	....	*s*, if present, is *o* by *sr* of 1.28

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3761.28	4	4, 6	10	−1.87	....	+1.30	....	o	....	
60.48	2	2, 1—	5	.49	....	2.42	....	o	....	*sb* may belong to another line
59.61	2	3	2	....	o	....	....	o	....	*p*- diffuse
59.46	5	3, 5	5	1.47	....	1.06	....	o	....	*sr o*
58.64	3	2	3	....	±.99	....	....	o	....	Symmetrical triplet
58.39	2	1	3	....	1.13	....	....	o	....	Symmetrical triplet *o* 8.64
57.88	6	3	8	....	.96	....	....	o	....	Symmetrical triplet
57.47	1	..	1	....	....	....	....	o	....	
56.93	1—	..	1	....	....	....	....	o	....	
56.36	3	1+	5	....	o	....	....	o	....	
56.17	2	..	1	....	....	....	....	o	....	
55.37	3	3	6	....	1.45	....	....	o	....	Symmetrical triplet
54.73	5	5, 3	10	....	.76	....	....	o	....	Symmetrical triplet
54.17	4	2, 1—	2	2.16	....	3.59	....	o	....	Possibly these *s*- components do not belong to this line
53.42	2	1 +	2	....	o	....	....	o	....	*p*- diffuse
52.73	20	20	40	....	1.43	....	....	o	....	Symmetrical triplet. *p*- broad but not resolved in second order
51.91	1	1, 1, ..	2	....	....	....	....	o	....	
51.22	2	1	2	....	.33	....	— .22	....	....	*s*- diffuse. No-f broad
50.82	1—	1	3	....	....	....	....	....	....	Quadruplet symmetrical
50.65	2	1	1	....	o	....	....	?	....	
50.30	..	1	1	....	o	....	....	o	....	
49.78	1—	1	1—	....	o	....	....	o	....	
49.65	3	.., 1	3	....	....	1.82	....	o	....	
49.26	2	..	..	....	....	....	....	....	....	
49.12	1	.., 1	..	....	....	1.27	....	....	....	
48.45	5	2, 4	10	1.50	....	.90	....	o	...	

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TABLE XIX– CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3747.73	10	..	..	....	....	....	....	....	....	Quadruplet symmetrical
46.64	2	..	..	....	....	....	....	....	....	Quadruplet symmetrical
46.15	12	15	30	....	....	+ .94	....	o	....	Triplet symmetrical
45.84	5	.., 2	5	....	....	1.22	....	o	....	No-f and *p*- have a *b* companion inten.=1—
45.38	2	..	1—	....	....	....	....	o	....	
45.11	1	2	1—	...	o	....	....	o	....	
44.89	4	2, 5	10	—1.76	....	.93	....	o	....	On *s*- plate exposed between comps., and *sr* is *o* of 5.11
44.05	1	2	2	....	o	....	....	o	....	No-f and *p*- *dr*
43.71	3	2	6	....	±1.12	....	....	o	....	
43.15	6	3	8	....	1.38	....	....	o	....	
42.45	1	1	2	....	o	....	....	o	....	
41.40	25	..	..	....	....	....	....	....	....	Quadruplet symmetrical
41.02	5	.., 4	8	....	....	.91	....	o	...	*sr* in shadow of 1.40
40.60	1	.., 1	1	....	....	....	....	o	....	
39.95	1—	1	1	....	o	....	....	o	....	
39.02	10	8, 5	15	....	1.04	....	....	o	....	*s*- is probably unsymmetrical, but no-f is not sharp enough on the edges to fix accurately the null position
38.62	1—	..	1—	....	....	....	....	o	....	
37.68	4	2	6	....	1.56	....	....	o	....	*sb o*
37.37	3	2	4	....	1.11	...	....	o	....	*s o*
37.15	2	1+	3	....	1.13	....	....	o	....	*sr o*
35.70	1	..	3	....	...	....	....	o	....	
35.05	4	2	6	....	1.56	....	....	o	....	*sb o*
34.77	4	3	6	....	.87	...	....	o	....	*sr o*

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TABLE XIX—CONTINUED

λ	Intensities			Δλ/λ²						Remarks
	No-f	s-	p-	s-			f-			
3733.85	2	1, 1	2	....	....	....	....	o	....	s- broad diff. Probably sym.
33.51	1	..	1	....	....	....	....	o	....	
32.76	2	1, 1	1	....	....	....	....	o	....	Triplet symmetrical
32.47	1	1, 3	1—	....	....	....	....	o	....	Triplet symmetrical; *sb o*
32.38	1	3	1+	....	o	....	....	o	....	
31.60	3	..	..	....	....	....	....	....	....	Quadruplet symmetrical
31.03	1—	1	1	....	o	....	....	o	....	
30.92	8	..	..	....	....	....	....	....	....	Quadruplet symmetrical
30.61	6	.., 2	5	....	....	+ .72	....	o	....	*sr* lost in shadow of 0.92
30.13	1+	..	..	....	....	....	....	....	....	
30.00	1	..	..	....	....	....	....	....	....	
28.05	6	..	..	....	....	....	....	....	....	Quadruplet symmetrical
27.76	2	..	1+	....	....	....	....	o	....	*s- o* 8.05 and 7.47
27.47	3	2	..	....	o ?	....	....	....	....	
27.35	3	..	3	....	....	....	....	o	....	Triplet symmetrical; *s-* too weak
26.89	10	8, 7	15	....	±1.37	....	....	o	....	Triplet symmetrical
26.32	1—	..	1—	....	....	....	....	o	....	
26.02	1—	1—	1—	....	o	....	....	o	....	
25.55	3	2	4	....	o	....	....	o	....	
24.93	4	3, 5	10	....	1.83	....	....	o	...	*sb* probably *o* by 4.70
24.70	1+	1	1	....	....	....	....	....	+ .34	One *sr* comp. between *sr* and *sb* of 4.93. Prob. one *sr o sb* of 4.93. There are one or two diff. *sb* comps. *p-* is weak and possibly a *pr* component
23.85	3	2, 5	6	—1.50	....	1.17	....	o	....	
23.46	2	5	3	....	o	....	....	o	....	
22.35	12	10	20	....	1.40	....	....	o	....	
22.05	15	..	..	....	....	....	....	....	....	9 components unsymmetrical

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TABLE XIX—CONTINUED

λ	INTENSITIES			Δλ/λ²						REMARKS
	No-f	*s*-	*p*-	*s*-			*p*-			
3721.76	1—	..	..	....	....	....	....	....	....	
21.64	1	..	..	....	....	....	....	....	....	
21.55	2	.., 1	2	....	....	....	....	o	....	
20.95	2	1+	3	....	o	....	....	o	....	
20.52	15	..	..	....	....	....	....	....	....	Quadruplet symmetrical
20.18	15	15, 12	25	....	±1.57	....	....	o	....	*p*- broad. Looks 2 or 3 comps.
19.90	1—	.., 1	1	....	....	....	....	o	....	
19.63	10	.., 5	15	....	1.22	....	....	o	....	*sr o*
19.27	1	..	1	....	....	....	— .50	....	....	
18.85	1	1, 1	2	....	1.84	....	....	o	....	
18.36	3	2, 2	6	....	1.24	....	....	o	....	*sb o*
18.02	5	3	8	....	....	....	....	....	....	*sr o*. Quadruplet symmetrical
16.98	1--	..	1	....	....	....	....	o	....	
16.72	2	..	2	....	....	....	....	o	....	
16.42	1--	..	1	....	....	....	....	o	..	
16.29	1—	..	..	....	....	....	....	..	....	
16.01	1—	..	1	....	....	....	....	o	....	
15.82	1+	..	..	....	....	....	....	....	....	
14.53	1	..	..	....	....	....	....	....	....	
12.80	5	2	5, 3	....	....	....	....	....	....	Quadruplet unsymmetrical.
12.04	1	..	3	....	....	....	....	o	....	
11.81	4	..	3, 3	....	....	....	....	± .74	....	
11.50	10	6, 4	20	....	1.56	....	....	o	....	*p*- broad, possibly triplet
09.82	5	1, 3	1, 5, ?	....	....	....	....	....	....	Unsym. 5 comps.
08.90	2	3, 2	6	....	1.16	....	....	o	....	
07.60	3	..	..	....	....	....	....	....	....	Quadruplet symmetrical
07.16	3	1	2	....	o	....	....	o	....	
06.15	..	2, 1	4	— .48	....	+ .95	....	o	....	

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TABLE XIX—CONCLUDED

λ	INTENSITIES			Δλ/λ²			REMARKS
	No-f	*s*-	*p*-	*s*-	*p*-		
3698.47	..	..	..	....	....		Quadruplet symmetrical
98.30	5	..	..	....	....		Quadruplet symmetrical
97.21	..	3, 2	2, 1	....	....		Quad. *p* .75, prob. unsym., *s* diff.
90.27	3	.., 1	2, 1	....	....	+ .64	Quad. 0.67, also quad. unsym.
78.16	4	..	..	....	....		Quadruplet unsymmetrical
78.00	1	..	..	....	....		Quadruplet unsymmetrical
77.90	1	2	1	.... 0	.... 0		
56.31	4	2, 1	6	— .55 .... +1.13	.... 0		

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TABLE XX

	Intensities		Remarks
	s-	*p*-	
4673.89	2	3	
4436.72	10	6	Adjacent to 6.40 and 6.20
4412.98	25	50	
4311.90	1+	3	
4184.95	5	7	
83.76	5	5	
80.99	5	4	
76.55	4	3	Possibly has an external pair of *p*-
75.00	1	1	
55.59	1	2	Preceded by two unsymmetrical triplets
55.46	4	5	4.94 is a weak *s*- doublet
52.45	2	3	
46.13	3	3	
3903.23	6	6	
3597.59	2	3	
90.42	4	3	
90.08	2	2	
89.22	5	6	
88.50	8	2	*s o* by 8.35
79.62	10	2	*s o* by 9.45
70.03	3	4	
69.82	3	3	
3545.59	5	6	
45.19	3	4	
44.25	2	3	Probably *s*=o
3498.77	2	5	
73.59	2	4	
24.09	4	8	
3359.87	1	1	
19.13	1+	3	
10.75	1	1	
3270.97	2	2	
57.27	3	5	
40.62	3	3	
35.00	1	1+	
22.00	1+	2	
3190.83	1+	2	
46.15	4	6	

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ADDENDUM

Zeeman (*Science Abstracts,* vol. 12, p. 155) confirms the results of Gmelin (*l. c.*) for Mercury line 5791. Purvis (*Proc. Camb. Phil. Soc.,* vol. XV, part I) records a displacement of several lines in the magnetic field toward the red. I had suspected such a change when watching lines under the microscope while an assistant turned the magnetic field current on and off, but had not followed it up with quantitative measurements. This could scarcely be identical with the results of Jack (*l. c.*). It would seem, rather, to be analogous to a pressure shift of the lines. H. Nagaoka and S. Amino (*Science Abstracts,* vol. 12, p. 155) have studied a few spectral lines with very weak fields. They find some unsymmetrical lines, with the red component stronger and least displaced. These displacements plotted against the magnetic field give a hyperbola. Beyond 5000 Gauss the separation is proportional to the field strength and the intensities of the opposite components are equal, i. e. the lines are then altogether symmetrical. This experiment is a signal confirmation of the Voigt theory. It suggests, too, as stated in previous pages, that the dissymmetries herein recorded are different in character and origin. We have, then, the following irregularities in the "Zeeman Effect": first, a displacement as noted by Purvis; second, the "Voigt Effect" developed from the dispersion equations, noted by H. Nagaoka and S. Amino; third, a variation in displacement proportional to the square of the field strength, first observed by Gmelin; fourth, a displacement proportional to the field strength, observed by the author. Some of these are different multiples of small values; fifth, an irregularity arising from the splitting of one of the symmetrical components, also observed by the author. Ions acting or "linked" together might produce results similar to the third and fourth, as shown by Voigt and Ritz.

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II.—*The Transmission of Light through Doubly Refracting Plates with Applications to Elliptic Analyzing Systems*

BY L. B. TUCKERMAN, JR.

The importance of the measurement of elliptically polarized light in the study of electro- and magneto-optic phenomena and the optical properties of various substances, has caused many different methods to be devised for the accurate measurement of ellipticity. Among these, the various halfshade methods offer the advantage of convenience combined with high sensibility. No adequate general discussion of these halfshade methods has, however, as yet been published, and this lack has probably contributed in part to the comparatively small use of halfshade methods by investigators. This paper is an attempt to supply this lack.

In discussing some halfshade systems it is necessary to know the effect of three or more successive doubly refracting plates. The direct calculation of this effect is laborious, and the general theorem given by Mallard is almost as cumbersome. The kinematical analogy due to Poincaré, an analogy whose simplicity and convenience make it invaluable in obtaining qualitative or roughly quantitative results, does not lend itself readily to the analytical discussion here desired. I have obtained a general theorem which combines comparative simplicity with ease of application. The first part of the paper gives the derivation of the general theorem and a discussion of its interpretation. The second part consists of the application of the theorem to various halfshade analyzers. No attempt has been made to discuss, except incidentally, the effects of chromatic dispersion or lack of plane parallelism in the light, although such effects are noticeable and even important in practice.

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I wish here to express my indebtedness to Mr. A. Q. Tool for his aid in revising the manuscript and in experimentally verifying many results.

GENERAL THEOREM

1. The Inductive Theorem

First Form. A plane wave of monochromatic, elliptically polarized light propagated away from the observer falls normally upon a series of plane parallel, doubly refracting plates. In each plate the planes of polarization of the ordinary and extraordinary vibrations are chosen as axes of reference, and the positive direction in each such that a positive rotation of 90° turns the + ordinary direction into the + extraordinary direction. Each plate is designated by a subscript $(1,2, \ldots, k,k+1, \ldots, n)$, and the constants of the light emerging from it, referred to the same axes, by the same subscript. The angle between the

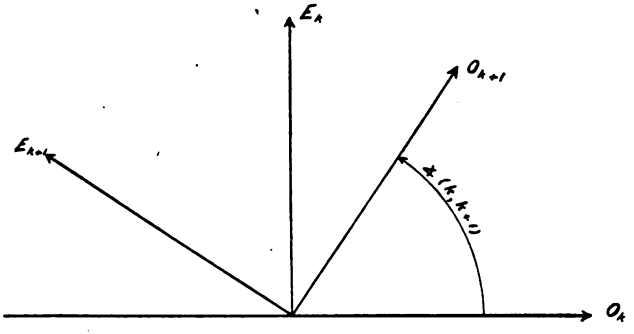

Fig. 1

ordinary axes or principal azimuths of two plates is designated by the subscripts in parentheses, as the angle $(k,k+1)$, and is assumed positive when a positive rotation through the angle $(k,k+1)$ will bring the axes of the first plate into coincidence with those of the second (fig. 1). The light as it emerges from the k th plate is assumed to be defined by the equations:

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$$x_k = O_k \cos \omega t$$
$$y_k = E_k \cos(\omega t - \phi_k)$$

where O_k and E_k are the amplitudes of the ordinary and extraordinary vibrations respectively, and ϕ_k, the phase lag of the extraordinary vibration on the ordinary. Referred to the axes of the $(k+1)$th plate, the equations take the form:

$$x'_{k+1} = O_{k+1} \cos(\omega t - \psi)$$
$$y'_{k+1} = E_{k+1} \cos(\omega t - \chi)$$

where O_{k+1}, E_{k+1}, ψ and χ are functions of O_k, E_k, ϕ_k and the angle $(k,k+1)$. Evaluating them we find:

$$\begin{aligned} x'_{k+1} &= O_k \cos \omega t \cos(k,k+1) + E_k \cos(\omega t - \phi_k) \sin(k,k+1) \\ &= [O_k \cos(k,k+1) + E_k \cos \phi_k \sin(k,k+1)] \cos \omega t \\ &\qquad + E_k \sin \phi_k \sin(k,k+1) \sin \omega t \\ &= O_{k+1} \cos \psi \cos \omega t + O_{k+1} \sin \psi \sin \omega t \end{aligned}$$

$$\begin{aligned} y'_{k+1} &= -O_k \cos \omega t \sin(k,k+1) + E_k \cos(\omega t - \phi_k) \cos(k,k+1) \\ &= [-O_k \sin(k,k+1) + E_k \cos \phi_k \cos(k,k+1)] \cos \omega t \\ &\qquad + E_k \sin \phi_k \cos(k,k+1) \sin \omega t \\ &= E_{k+1} \cos \chi \cos \omega t + E_{k+1} \sin \chi \sin \omega t. \end{aligned}$$

This gives the values of $O_{k+1} \cos \psi$ and $O_{k+1} \sin \psi$, and of $E_{k+1} \cos \chi$ and $E_{k+1} \sin \chi$. Squaring each and adding corresponding pairs eliminates the phase angles and gives the values of O^2_{k+1} and E^2_{k+1}.

$$O^2_{k+1} = O^2_k \cos^2(k,k+1) + E^2_k \sin^2(k,k+1) + O_k E_k \cos \phi_k \sin 2(k,k+1)$$
$$E^2_{k+1} = O^2_k \sin^2(k,k+1) + E^2_k \cos^2(k,k+1) - O_k E_k \cos \phi_k \sin 2(k,k+1).$$

In passing through the plate $(k+1)$ both ordinary and extraordinary vibrations are retarded. The emergent light will be given by:

$$x_{k+1} = O_{k+1} \cos(\omega t - \psi - 2\pi N_{O_{k+1}})$$
$$y_{k+1} = E_{k+1} \cos(\omega t - \chi - 2\pi N_{E_{k+1}})$$

where $N_{O_{k+1}}$ and $N_{E_{k+1}}$ are the orders of the plate for ordinary and extraordinary waves measured in wave-lengths.

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Then:
$$\begin{aligned}\phi_{k+1}&=\chi-\psi-2\pi(N_{O_{k+1}}-N_{E_{k+1}})\\&=\chi-\psi-2\pi N_{k+1}\end{aligned}$$

where N_{k+1} is the differential order of the plate and is positive if the ordinary wave is the slower.

By forming the expression $O_{k+1}E_{k+1}\cos\phi_{k+1}$; expanding in terms of χ and ψ; substituting the values found above for $O_{k+1}\cos\psi$, $O_{k+1}\sin\psi$, $E_{k+1}\cos\chi$ and $E_{k+1}\sin\chi$; and simplifying the resulting expression, the following equation is obtained:

$$\begin{aligned}O_{k+1}E_{k+1}\cos\phi_{k+1}=&[\tfrac{1}{2}(E^2_k-O^2_k)\sin 2(k,k+1)\\&+O_kE_k\cos\phi_k\cos 2(k,k+1)]\cos 2\pi N_{k+1}+O_kE_k\sin\phi_k\sin 2\pi N_{k+1}.\end{aligned}$$

Similarly:

$$\begin{aligned}O_{k+1}E_{k+1}\sin\phi_{k+1}=&-[\tfrac{1}{2}(E^2_k-O^2_k)\sin 2(k,k+1)\\&+O_kE_k\cos\phi_k\cos 2(k,k+1)]\sin 2\pi N_{k+1}+O_kE_k\sin\phi_k\cos 2\pi N_{k+1}.\end{aligned}$$

To simplify the above results the following notation is introduced:

$$\begin{array}{lll}O^2=I & I+J=2\boldsymbol{P} & OE\cos\phi=\boldsymbol{K}\\ E^2=J & I-J=2\boldsymbol{Q} & OE\sin\phi=\boldsymbol{S}\end{array}\qquad(1)$$

Introducing these symbols the equations become:

$$\begin{aligned}I_{k+1}&=I_k\cos^2(k,k+1)+J_k\sin^2(k,k+1)+\boldsymbol{K}_k\sin 2(k,k+1)\\J_{k+1}&=I_k\sin^2(k,k+1)+J_k\cos^2(k,k+1)-\boldsymbol{K}_k\sin 2(k,k+1)\\\boldsymbol{K}_{k+1}&=[\tfrac{1}{2}(J_k-I_k)\sin 2(k,k+1)+\boldsymbol{K}_k\cos 2(k,k+1)]\cos 2\pi N_{k+1}\\&\qquad+\boldsymbol{S}_k\sin 2\pi N_{k+1}\\\boldsymbol{S}_{k+2}&=-[\tfrac{1}{2}(J_k-I_k)\sin 2(k,k+1)+\boldsymbol{K}_k\cos 2(k,k+1)]\sin 2\pi N_{k+1}\\&\qquad+\boldsymbol{S}_k\cos 2\pi N_{k+1}\end{aligned}$$

and finally the inductive theorem in its first form:

$$\begin{aligned}\boldsymbol{P}_{k+1}&=+\boldsymbol{P}_k\\\boldsymbol{Q}_{k+1}&=+\boldsymbol{Q}_k\cos 2(k,k+1)\\&\qquad+\boldsymbol{K}_k\sin 2(k,k+1)\\\boldsymbol{K}_{k+1}&=-\boldsymbol{Q}_k\sin 2(k,k+1)\cos 2\pi N_{k+1}\\&\qquad+\boldsymbol{K}_k\cos 2(k,k+1)\cos 2\pi N_{k+1}\\&\qquad+\boldsymbol{S}_k\sin 2\pi N_{k+1}\end{aligned}\qquad(2)$$

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$$\begin{aligned} S_{k+1} = &+ Q_k \sin 2(k,k+1) \sin 2\pi N_{k+1} \\ &- K_k \cos 2(k,k+1) \sin 2\pi N_{k+1} \\ &+ S_k \cos 2\pi N_{k+1} \end{aligned} \qquad (2)$$

These four equations form the general inductive theorem for the passage of elliptically polarized light normally through plane parallel doubly refracting plates. This theorem neglects all losses by reflection at the surfaces of the plates, and by absorption in the plates. These alter the intensity of the light by quantities of the first order, but their differential effects are, in transparent media, all of the second order and hence do not measurably affect the character of the polarization of the light.

Second Form. If the theorem in this first form be applied twice in succession:

$$P_{k+2} = +P_k$$

$$\begin{aligned} Q_{k+2} = &+ Q_k \left| \begin{array}{l} +\cos 2(k,k+1) \cos 2(k+1,k+2) \\ -\sin 2(k,k+1) \sin 2(k+1,k+2) \cos 2\pi N_{k+1} \end{array} \right| \\ &+ K_k \left| \begin{array}{l} +\sin 2(k,k+1) \cos 2(k+1,k+2) \\ +\cos 2(k,k+1) \sin 2(k+1,k+2) \cos 2\pi N_{k+1} \end{array} \right| \\ &+ S_k \sin 2(k+1,k+2) \sin 2\pi N_{k+1} \end{aligned}$$

$$\begin{aligned} K_{k+2} = &+ Q_k \left| \begin{array}{l} -\cos 2(k,k+1) \sin 2(k+1,k+2) \ldots \cos 2\pi N_{k+2} \\ -\sin 2(k,k+1) \cos 2(k+1,k+2) \cos 2\pi N_{k+1} \cos 2\pi N_{k+2} \\ +\sin 2(k,k+1) \ldots \sin 2\pi N_{k+1} \sin 2\pi N_{k+2} \end{array} \right| \\ &+ K_k \left| \begin{array}{l} -\sin 2(k,k+1) \sin 2(k+1,k+2) \ldots \cos 2\pi N_{k+2} \\ +\cos 2(k,k+1) \cos 2(k+1,k+2) \cos 2\pi N_{k+1} \cos 2\pi N_{k+2} \\ -\cos 2(k,k+1) \ldots \sin 2\pi N_{k+1} \sin 2\pi N_{k+2} \end{array} \right| \\ &+ S_k \left| \begin{array}{l} +\cos 2(k+1,k+2) \sin 2\pi N_{k+1} \cos 2\pi N_{k+2} \\ +\ldots \cos 2\pi N_{k+1} \sin 2\pi N_{k+2} \end{array} \right| \end{aligned}$$

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$$S_{k+2}=+Q_k\begin{vmatrix}+\cos 2(k,k+1)\sin 2(k+1,k+2).\ .\ .\ .\ .\ .\ \sin 2\pi N_{k+2}\\ +\sin 2(k,k+1)\cos 2(k+1,k+2)\cos 2\pi N_{k+1}\sin 2\pi N_{k+2}\\ +\sin 2(k,k+1).\ .\ .\ .\ .\ .\ .\ .\ .\ \sin 2\pi N_{k+1}\cos 2\pi N_{k+2}\end{vmatrix}$$

$$+K_k\begin{vmatrix}+\sin 2(k,k+1)\sin 2(k+1,k+2).\ .\ .\ .\ .\ .\ \sin 2\pi N_{k+2}\\ -\cos 2(k,k+1)\cos 2(k+1,k+2)\cos 2\pi N_{k+1}\sin 2\pi N_{k+2}\\ -\cos 2(k,k+1).\ .\ .\ .\ .\ .\ .\ .\ .\ \sin 2\pi N_{k+1}\cos 2\pi N_{k+2}\end{vmatrix}$$

$$+S_k\begin{vmatrix}-\cos 2(k+1,k+2)\sin 2\pi N_{k+1}\sin 2\pi N_{k+2}\\ +\ .\ .\ .\ .\ .\ .\ .\ .\ \cos 2\pi N_{k+1}\cos 2\pi N_{k+2}\end{vmatrix}$$

If in these equations the following substitutions are made:

$$P_{k+2}=P'_{k+1}\qquad Q_{k+2}=Q'_{k+1}\qquad \measuredangle(k+1,k+2)=-\measuredangle(k,k+1)$$
$$K_{k+2}=K'_{k+1}\qquad S_{k+2}=S'_{k+1}\qquad N_{k+2}=0$$

they give the change produced by the $(k+1)$th plate when the emergent light is referred to the same axes as the incident light, instead of, as in the first form, to the axes of the $(k+1)$th plate. This gives the theorem in its second form:

$$P'_{k+1}=+P_k$$

$$\begin{aligned}Q'_{k+1}=&+Q_k[1-2\sin^2 2(k,k+1)\sin^2\pi N_{k+1}]\\ &+K_k\sin 4(k,k+1)\sin^2\pi N_{k+1}\\ &-S_k\sin 2(k,k+1)\sin 2\pi N_{k+1}\end{aligned}$$

$$\begin{aligned}K'_{k+1}=&+Q_k\sin 4(k,k+1)\sin^2\pi N_{k+1}\\ &+K_k[1-2\cos^2 2(k,k+1)\sin^2\pi N_{k+1}]\\ &+S_k\cos 2(k,k+1)\sin 2\pi N_{k+1}\end{aligned}\qquad (3)$$

$$\begin{aligned}S'_{k+1}=&+Q_k\sin 2(k,k+1)\sin 2\pi N_{k+1}\\ &-K_k\cos 2(k,k+1)\sin 2\pi N_{k+1}\\ &+S_k\cos 2\pi N_{k+1}\end{aligned}$$

This alternative form of the theorem, while not so simple

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and therefore not usually so convenient as the first, is useful in discussing the effect of the rotation of a single plate, as in the discussion of errors and in the geometrical analogy of Poincaré's sphere.

2. General Theorem

To obtain the effect of n successive plates it is necessary to apply the inductive theorem n times in succession. The transformations of $\boldsymbol{Q}$, $\boldsymbol{K}$ and $\boldsymbol{S}$ in equations (2) and (3) are linear transformations. A series of linear transformations give a linear transformation as a resultant, the coefficients of the resultant transformation being obtained from those of the series by the theorem for the multiplication of determinants. The following notation is convenient:

$$\begin{aligned}
\boldsymbol{Q}_{k+1} &= (Q_k, Q_{k+1})\boldsymbol{Q}_k + (K_k, Q_{k+1})\boldsymbol{K}_k + (S_k, Q_{k+1})\boldsymbol{S}_k \\
\boldsymbol{K}_{k+1} &= (Q_k, K_{k+1})\boldsymbol{Q}_k + (K_k, K_{k+1})\boldsymbol{K}_k + (S_k, K_{k+1})\boldsymbol{S}_k \qquad (4) \\
\boldsymbol{S}_{k+1} &= (Q_k, S_{k+1})\boldsymbol{Q}_k + (K_k, S_{k+1})\boldsymbol{K}_k + (S_k, S_{k+1})\boldsymbol{S}_k \\
& k = 0, 1, 2, 3, \ldots . (n-1).
\end{aligned}$$

and

$$\begin{aligned}
\boldsymbol{Q}_n &= (Q_0, Q_n)\boldsymbol{Q}_0 + (K_0, Q_n)\boldsymbol{K}_0 + (S_0, Q_n)\boldsymbol{S}_0 \\
\boldsymbol{K}_n &= (Q_0, K_n)\boldsymbol{Q}_0 + (K_0, K_n)\boldsymbol{K}_0 + (S_0, K_n)\boldsymbol{S}_0 \qquad (5) \\
\boldsymbol{S}_n &= (Q_0, S_n)\boldsymbol{Q}_0 + (K_0, S_n)\boldsymbol{K}_0 + (S_0, S_n)\boldsymbol{S}_0
\end{aligned}$$

where (Q_k, K_{k+1}) is a symbol representing the coefficient of $\boldsymbol{Q}_k$ in the expression for $\boldsymbol{K}_{k+1}$, (S_0, Q_n) representing the coefficient of $\boldsymbol{S}_0$ in $\boldsymbol{Q}_n$, etc.

The effect of n successive plates is then known when the coefficients (Q_0, Q_n), (Q_0, K_n), etc., are expanded in terms of (Q_k, Q_{k+1}), (Q_k, K_{k+1}), etc., for $k = 0, 1, 2, 3, \ldots . (n-1)$. The theorem for the multiplication of determinants gives:

$$(a_0, a_n) = \sum_{a_k} \prod_{k=0}^{k=n-1} (a_k, a_{k+1}) \qquad (6)$$

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where $\alpha_k = \boldsymbol{Q}_k, \boldsymbol{K}_k$, or $\boldsymbol{S}_k$, and $\sum_{\alpha_k}$ indicates the summation of the results obtained by substituting these values in all possible combinations.

This is the required relation between (Q_o, Q_n), (Q_o, K_n), etc., and (Q_k, Q_{k+1}), (Q_k, K_{k+1}), etc.

The coefficients (α_k, α_{k+1}) for the two forms of the inductive theorem are:

First Form

$$\begin{aligned}
(Q_k, Q_{k+1}) &= +\cos 2(k, k+1) \\
(K_k, K_{k+1}) &= +\cos 2(k, k+1) \cos 2\pi N_{k+1} \\
(S_k, S_{k+1}) &= +\cos 2\pi N_{k+1} \\
(K_k, S_{k+1}) &= -\cos 2(k, k+1) \sin 2\pi N_{k+1} \\
(S_k, K_{k+1}) &= +\sin 2\pi N_{k+1} \\
(S_k, Q_{k+1}) &= 0 \\
(Q_k, S_{k+1}) &= +\sin 2(k, k+1) \sin 2\pi N_{k+1} \\
(Q_k, K_{k+1}) &= -\sin 2(k, k+1) \cos 2\pi N_{k+1} \\
(K_k, Q_{k+1}) &= +\sin 2(k, k+1)
\end{aligned} \tag{7}$$

Second Form

$$\begin{aligned}
(Q_k, Q_{k+1}) &= 1 - 2\sin^2 2(k, k+1) \sin^2 \pi N_{k+1} \\
(K_k, K_{k+1}) &= 1 - 2\cos^2 2(k, k+1) \sin^2 \pi N_{k+1} \\
(S_k, S_{k+1}) &= +\cos 2\pi N_{k+1} \\
(K_k, S_{k+1}) &= -\cos 2(k, k+1) \sin 2\pi N_{k+1} \\
(S_k, K_{k+1}) &= +\cos 2(k, k+1) \sin 2\pi N_{k+1} \\
(S_k, Q_{k+1}) &= -\sin 2(k, k+1) \sin 2\pi N_{k+1} \\
(Q_k, S_{k+1}) &= +\sin 2(k, k+1) \sin 2\pi N_{k+1} \\
(Q_k, K_{k+1}) &= +\sin 4(k, k+1) \sin^2 \pi N_{k+1} \\
(K_k, Q_{k+1}) &= +\sin 4(k, k+1) \sin^2 \pi N_{k+1}
\end{aligned} \tag{8}$$

The equations for the effect of any number of plates can then be written directly in either of the two forms by the use of equation

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(6). These equations can be transformed into a form analogous to that given by Mallard,[1] involving functions of the sums and differences of the orders of the plates, but the result is more complicated and less convenient for use.

Inverse Form.—It will be shown later (5, p. 15) that the coefficients (Q_o, Q_n), (Q_o, K_n), etc., may be considered as the direction cosines of a rotation of a system of rectangular coordinates. The inverse theorem may therefore be written:

$$\begin{aligned} \boldsymbol{Q}_o &= (Q_o, Q_n)\,\boldsymbol{Q}_n + (Q_o, K_n)\,\boldsymbol{K}_n + (Q_o, S_n)\,\boldsymbol{S}_n \\ \boldsymbol{K}_o &= (K_o, Q_n)\,\boldsymbol{Q}_n + (K_o, K_n)\,\boldsymbol{K}_n + (K_o, S_n)\,\boldsymbol{S}_n \\ \boldsymbol{S}_o &= (S_o, Q_n)\,\boldsymbol{Q}_n + (S_o, K_n)\,\boldsymbol{K}_n + (S_o, S_n)\,\boldsymbol{S}_n \end{aligned} \qquad (9)$$

3. Special Cases

The following special cases of the general theorem will be used in the applications following and are here given for convenient reference.

Initial light:

$$\boldsymbol{P}_o,\ \boldsymbol{Q}_o,\ \boldsymbol{K}_o,\ \boldsymbol{S}_o. \qquad (10)$$

After passing through one plate:

First Form

$$\begin{aligned} \boldsymbol{P}_1 &= +\boldsymbol{P}_o \\ \boldsymbol{Q}_1 &= +\boldsymbol{Q}_o \cos 2(o,1) \\ &\quad -\boldsymbol{K}_o \sin 2(o,1) \\ \boldsymbol{K}_1 &= -\boldsymbol{Q}_o \sin 2(o,1)\ \cos 2\pi N_1 \\ &\quad +\boldsymbol{K}_o \cos 2(o,1)\ \cos 2\pi N_1 \\ &\quad +\boldsymbol{S}_o \ldots\ldots \sin 2\pi N_1 \\ \boldsymbol{S}_1 &= +\boldsymbol{Q}_o \sin 2(o,1)\ \sin 2\pi N_1 \\ &\quad -\boldsymbol{K}_o \cos 2(o,1)\ \sin 2\pi N_1 \\ &\quad \boldsymbol{S}_o \ldots\ldots \cos 2\pi N_1 \end{aligned} \qquad (11)$$

[1] Mallard E. *Traité de Cristallographie*, Paris, 1884, T. 2, pp. 169–74.

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Second Form

$$P_1 = +P_0$$

$$\begin{aligned} Q_1 = &+Q_0[1-2\sin^2 2(0,1)\sin^2\pi N_1] \\ &+K_0 \sin 4(0,1)\sin \pi N_1 \\ &-S_0 \sin 2(0,1)\sin 2\pi N_1 \end{aligned}$$

$$\begin{aligned} K_1 = &+Q_0 \sin 4(0,1)\sin^2\pi N_1 \\ &+K_0[1-2\cos^2 2(0,1)\sin^2\pi N_1] \\ &+S_0 \cos 2(0,1)\sin 2\pi N_1 \end{aligned} \qquad (12)$$

$$\begin{aligned} S_1 = &+Q_0 \sin 2(0,1)\sin 2\pi N_1 \\ &-K_0 \cos 2(0,1)\sin 2\pi N_1 \\ &+S_0 \ldots\ldots \cos 2\pi N_1 \end{aligned}$$

Inverse Second Form

$$P_0 = +P_1$$

$$\begin{aligned} Q_0 = &+Q_1[1-2\sin^2 2(0,1)\sin^2\pi N_1] \\ &+K_1 \sin 4(0,1)\sin^2\pi N_1 \\ &+S_1 \sin 2(0,1)\sin 2\pi N_1 \end{aligned}$$

$$\begin{aligned} K_0 = &+Q_1 \sin 4(0,1)\sin^2\pi N_1 \\ &+K_1[1-\cos^2 2(0,1)\sin^2\pi N_1] \\ &-S_1 \cos 2(0,1)\sin 2\pi N_1 \end{aligned} \qquad (13)$$

$$\begin{aligned} S_0 = &-Q_1 \sin 2(0,1)\sin 2\pi N_1 \\ &+K_1 \cos 2(0,1)\sin 2\pi N_1 \\ &+S_1 \ldots\ldots \cos 2\pi N_1 \end{aligned}$$

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After passing through two plates:

First Form

$$P_2 = +P_0$$

$$\begin{aligned} Q_2 = &+Q_0 \begin{vmatrix} +\cos 2(0,1) & \dots & \cos 2(1,2) \\ -\sin 2(0,1)\cos 2\pi N_1 & & \sin 2(1,2) \end{vmatrix} \\ &+K_0 \begin{vmatrix} +\sin 2(0,1) & \dots & \cos 2(1,2) \\ +\cos 2(0,1)\cos 2\pi N_1 & & \sin 2(1,2) \end{vmatrix} \\ &+S_0 \dots \dots \sin 2\pi N_1 \sin 2(1,2) \end{aligned}$$

$$\begin{aligned} K_2 = &+Q_0 \begin{vmatrix} -\cos 2(0,1) & \dots & \sin 2(1,2)\cos 2\pi N_2 \\ -\sin 2(0,1)\cos 2\pi N_1 & & \cos 2(1,2)\cos 2\pi N_2 \\ +\sin 2(0,1)\sin 2\pi N_1 & \dots & \sin 2\pi N_2 \end{vmatrix} \\ &+K_0 \begin{vmatrix} -\sin 2(0,1) & \dots & \sin 2(1,2)\cos 2\pi N_2 \\ +\cos 2(0,1)\cos 2\pi N_1 & & \cos 2(1,2)\cos 2\pi N_2 \\ -\cos 2(0,1)\sin 2\pi N_1 & \dots & \sin 2\pi N_2 \end{vmatrix} \\ &+S_0 \begin{vmatrix} + & \dots & \sin 2\pi N_1 \cos 2(1,2)\cos 2\pi N_2 \\ + & \dots & \cos 2\pi N_1 \dots \sin 2\pi N_2 \end{vmatrix} \end{aligned} \qquad (14)$$

$$\begin{aligned} S_2 = &+Q_0 \begin{vmatrix} +\cos 2(0,1) & \dots & \sin 2(1,2)\sin 2\pi N_2 \\ +\sin 2(0,1)\cos 2\pi N_1 & & \cos 2(1,2)\sin 2\pi N_2 \\ +\sin 2(0,1)\sin 2\pi N_1 & \dots & \cos 2\pi N_2 \end{vmatrix} \\ &+K_0 \begin{vmatrix} +\sin 2(0,1) & \dots & \sin 2(1,2)\sin 2\pi N_2 \\ -\cos 2(0,1)\cos 2\pi N_1 & & \cos 2(1,2)\sin 2\pi N_2 \\ -\cos 2(0,1)\sin 2\pi N_1 & \dots & \cos 2\pi N_2 \end{vmatrix} \\ &+S_0 \begin{vmatrix} - & \dots & \sin 2\pi N_1 \cos 2(1,2)\sin 2\pi N_2 \\ + & \dots & \cos 2\pi N_1 \dots \cos 2\pi N_2 \end{vmatrix} \end{aligned}$$

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After passing through three plates:

First Form

$$\begin{aligned}
\boldsymbol{Q}_3 = +\boldsymbol{Q}_0 &\left|\begin{array}{l}
+\cos 2(0,1) \ldots\ldots \cos 2(1,2) \ldots\ldots \cos 2(2,3) \\
-\cos 2(0,1) \ldots\ldots \sin 2(1,2) \cos 2\pi N_2 \sin 2(2,3) \\
-\sin 2(0,1) \cos 2\pi N_1 \sin 2(1,2) \ldots\ldots \cos 2(2,3) \\
-\sin 2(0,1) \cos 2\pi N_1 \cos 2(1,2) \cos 2\pi N_2 \sin 2(2,3) \\
+\sin 2(0,1) \sin 2\pi N_1 \ldots\ldots \sin 2\pi N_2 \sin 2(2,3)
\end{array}\right| \\
+\boldsymbol{K}_0 &\left|\begin{array}{l}
-\sin 2(0,1) \ldots\ldots \cos 2(1,2) \ldots\ldots \cos 2(2,3) \\
-\sin 2(0,1) \ldots\ldots \sin 2(1,2) \cos 2\pi N_2 \sin 2(2,3) \\
+\cos 2(0,1) \cos 2\pi N_1 \sin 2(1,2) \ldots\ldots \cos 2(2,3) \\
+\cos 2(0,1) \cos 2\pi N_1 \cos 2(1,2) \cos 2\pi N_2 \sin 2(2,3) \\
-\cos 2(0,1) \sin 2\pi N_1 \ldots\ldots \sin 2\pi N_2 \sin 2(2,3)
\end{array}\right| \qquad (15) \\
+\boldsymbol{S}_0 &\left|\begin{array}{l}
+ \ldots\ldots \sin 2\pi N_1 \sin 2(1,2) \ldots\ldots \cos 2(2,3) \\
+ \ldots\ldots \sin 2\pi N_1 \cos 2(1,2) \cos 2\pi N_2 \sin 2(2,3) \\
+ \ldots\ldots \cos 2\pi N_1 \ldots\ldots \sin 2\pi N_2 \sin 2(2,3)
\end{array}\right|
\end{aligned}$$

4. Interpretation of Results

If the major and minor axes of the original ellipse are taken as axes of reference, the following relations are obtained:

$$\begin{aligned}
\boldsymbol{P}_0 &= \tfrac{1}{2}(O^2_0 + E^2_0) = \tfrac{1}{2} I_0 (1 + e^2_0) \\
\boldsymbol{Q}_0 &= \tfrac{1}{2}(O^2_0 - E^2_0) = \tfrac{1}{2} I_0 (1 - e^2_0) = \boldsymbol{P}_0 \frac{1 - e^2_0}{1 + e^2_0} \\
\boldsymbol{K}_0 &= O_0 E_0 \cos\phi_0 = O_0 E_0 \cos\frac{\pi}{2} = 0 \qquad (16) \\
\boldsymbol{S}_0 &= O_0 E_0 \sin\phi_0 = I_0 e_0 \sin\frac{\pi}{2} = \boldsymbol{P}_0 \frac{2e_0}{1 + e^2_0}
\end{aligned}$$

where e, the ellipticity of the light, is the ratio $\frac{E}{O}$. The values of $\boldsymbol{P}$, $\boldsymbol{Q}$, $\boldsymbol{K}$ and $\boldsymbol{S}$ referred to any axes may be obtained by giving N_1

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in equation (11) the value o and finding P_1, Q_1, K_1 and S_1. Letting the $\measuredangle(o,1)=-\theta_o$, this gives:

$$\begin{aligned} P_1&=P_o \\ Q_1&=Q_o\cos 2(o,1)=P_o\frac{1-e^2_o}{1+e^2_o}\cos 2\theta_o \\ K_1&=-Q_o\sin 2(o,1)=P_o\frac{1-e^2_o}{1+e^2_o}\sin 2\theta_o \\ S_1&=S_o=P_o\frac{2e_o}{1+e^2_o} \end{aligned} \qquad (17)$$

P and S are therefore invariant for any rotation of the axes.

When the direction of propagation and the plane of the ordinary vibration are given, P, Q, K and S completely define the properties of any completely polarized light. In fact, only three of them are necessary since there exists between them the equation:

$$Q^2+K^2+S^2=P^2 \qquad (18)$$

From equations (17) any of the ordinary constants of the light may easily be obtained. The following are the more important ones:

The ordinary and extraordinary intensities, I and J:

$$I=P+Q \qquad J=P-Q \qquad (19)$$

The phase lag of the extraordinary on the ordinary vibration:

$$\phi=\text{arc tg}\frac{S}{K} \qquad (20)$$

The intensities of the light in the major and minor axes of the ellipse, I_m and J_m:

$$\begin{aligned} I_m&=P+\sqrt{P^2-S^2} \\ J_m&=P-\sqrt{P^2-S^2} \end{aligned} \qquad (21)$$

The angle θ which the major axis of the ellipse makes with the plane of the ordinary vibration:

$$\theta=\tfrac{1}{2}\,\text{arc tg}\frac{K}{Q} \qquad (22)$$

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The total intensity of the light $=2\boldsymbol{P}$;
The ellipticity e, the ratio of the minor and major axes of the ellipse. The ellipticity is considered positive when the light vector rotates counter clockwise, as we look in the direction of propagation of the light.

$$e=\frac{\boldsymbol{P}-\sqrt{\boldsymbol{P}^2-\boldsymbol{S}^2}}{\boldsymbol{S}} \tag{23}$$

The positive sign of the square root is always taken so that $-1<e<+1$.

The following inverse relations are also useful:

$$\begin{aligned} 2\boldsymbol{P}&=I+J=I_m+J_m \\ 2\boldsymbol{Q}&=I-J=(I_m-J_m)\cos 2\theta=2\boldsymbol{P}\frac{1-e^2}{1+e^2}\cos 2\theta \\ 2\boldsymbol{K}&=2\sqrt{IJ}\cos\phi=(I_m-J_m)\sin 2\theta=2\boldsymbol{P}\frac{1-e^2}{1+e^2}\sin 2\theta \\ \boldsymbol{S}&=\sqrt{IJ}\sin\phi=\sqrt{I_mJ_m}=\boldsymbol{P}\frac{2e}{1+e^2} \end{aligned} \tag{24}$$

It is often convenient to express the ellipticity in terms of an auxiliary angle, ω, defined by the equation, $\operatorname{tg}\omega=e$. Then

$$\frac{1-e^2}{1+e^2}=\cos 2\omega, \quad \frac{2e}{1+e^2}=\sin 2\omega \quad \text{and} \quad \frac{2e}{1-e^2}=\operatorname{tg} 2\omega$$

from which:

$$\begin{aligned} \boldsymbol{Q}&=\boldsymbol{P}\cos 2\omega\cos 2\theta \\ \boldsymbol{K}&=\boldsymbol{P}\cos 2\omega\sin 2\theta \\ \boldsymbol{S}&=\boldsymbol{P}\sin 2\omega \end{aligned} \tag{25}$$

5. The Poincaré Sphere

The equation:

$$\boldsymbol{Q}^2+\boldsymbol{K}^2+\boldsymbol{S}^2=\boldsymbol{P}^2 \tag{18}$$

suggests a geometric representation of the quantities involved. Letting $\boldsymbol{Q}$, $\boldsymbol{K}$ and $\boldsymbol{S}$ represent the distances of a point from the

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origin along three right-handed rectangular axes, then the locus $\boldsymbol{P}=$ constant, is a sphere. Poincaré[1] has pointed out a beautiful analogy between the action of a doubly refracting plate and the rotation of a sphere. Examination shows that the sphere defined above is the Poincaré Sphere.

The general linear transformation:

$$\begin{aligned}\boldsymbol{Q}_{k+1}&=(Q_k,Q_{k+1})\boldsymbol{Q}_k+(K_k,Q_{k+1})\boldsymbol{K}_k+(S_k,Q_{k+1})\boldsymbol{S}_k\\ \boldsymbol{K}_{k+1}&=(Q_k,K_{k+1})\boldsymbol{Q}_k+(K_k,K_{k+1})\boldsymbol{K}_k+(S_k,K_{k+1})\boldsymbol{S}_k\\ \boldsymbol{S}_{k+1}&=(Q_k,S_{k+1})\boldsymbol{Q}_k+(K_k,S_{k+1})\boldsymbol{K}_k+(S_k,S_{k+1})\boldsymbol{S}_k\end{aligned}\qquad(4)$$

represents the rotation of a solid body, provided:

$$\begin{aligned}(Q_k,Q_{k+1})^2+(K_k,Q_{k+1})^2+(S_k,Q_{k+1})^2&=1\\ (Q_k,K_{k+1})^2+(K_k,K_{k+1})^2+(S_k,K_{k+1})^2&=1\\ (Q_k,S_{k+1})^2+(K_k,S_{k+1})^2+(S_k,S_{k+1})^2&=1\end{aligned}\qquad(26)$$

$$\begin{aligned}(Q_k,K_{k+1})(Q_k,S_{k+1})+(K_k,K_{k+1})(K_k,S_{k+1})+(S_k,K_{k+1})(S_k,S_{k+1})&=0\\ (Q_k,S_{k+1})(Q_k,Q_{k+1})+(K_k,S_{k+1})(K_k,Q_{k+1})+(S_k,S_{k+1})(S_k,Q_{k+1})&=0\\ (Q_k,Q_{k+1})(Q_k,K_{k+1})+(K_k,Q_{k+1})(K_k,K_{k+1})+(S_k,Q_{k+1})(S_k,K_{k+1})&=0\end{aligned}\qquad(27)$$

and

$$\begin{vmatrix}(Q_k,Q_{k+1}), & (K_k,Q_{k+1}), & (S_k,Q_{k+1})\\ (Q_k,K_{k+1}), & (K_k,K_{k+1}), & (S_k,K_{k+1})\\ (Q_k,S_{k+1}), & (K_k,S_{k+1}), & (S_k,S_{k+1})\end{vmatrix}=+1\qquad(28)$$

These equations are satisfied by both forms of the inductive and general theorems given above. The coefficients of a linear transformation satisfying the above conditions may be written:

$$\begin{aligned}(Q_k,Q_{k+1})&=1-2\sin^2 a\sin^2\tfrac{1}{2}r\\ (K_k,K_{k+1})&=1-2\sin^2 b\sin^2\tfrac{1}{2}r\\ (S_k,S_{k+1})&=1-2\sin^2 c\sin^2\tfrac{1}{2}r\end{aligned}\qquad(29)$$

[1] Poincaré H. *Théorie Mathématique de la Lumière,* Paris, 1892, T. 2, pp. 275–85.

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$$
\begin{aligned}
(K_k, S_{k+1}) &= 2\cos b\cos c\sin^2 \tfrac{1}{2}r - \cos a\sin r \\
(S_k, K_{k+1}) &= 2\cos b\cos c\sin^2 \tfrac{1}{2}r + \cos a\sin r \\
(S_k, Q_{k+1}) &= 2\cos c\cos a\sin^2 \tfrac{1}{2}r - \cos b\sin r \\
(Q_k, S_{k+1}) &= 2\cos c\cos a\sin^2 \tfrac{1}{2}r + \cos b\sin r \\
(Q_k, K_{k+1}) &= 2\cos a\cos b\sin^2 \tfrac{1}{2}r - \cos c\sin r \\
(K_k, Q_{k+1}) &= 2\cos a\cos b\sin^2 \tfrac{1}{2}r + \cos c\sin r
\end{aligned}
\qquad (29)
$$

Where cos a, cos b and cos c are the direction cosines of the axis of rotation, and r, the angle of rotation.
From these,

$$
\begin{aligned}
\sin r &= \tfrac{1}{2}\sqrt{4-[(Q_k, Q_{k+1})+(K_k, K_{k+1})+(S_k, S_{k+1})-1]^2} \\
\cos a &= \tfrac{1}{2}\frac{(S_k, K_{k+1})-(K_k, S_{k+1})}{\sin r} \\
\cos b &= \tfrac{1}{2}\frac{(Q_k, S_{k+1})-(S_k, Q_{k+1})}{\sin r} \\
\cos c &= \tfrac{1}{2}\frac{(K_k, Q_{k+1})-(Q_k, K_{k-1})}{\sin r}
\end{aligned}
\qquad (30)
$$

Substituting in the above the values of the coefficients in the second form of the inductive theorem, since that form gives the simpler results,

$$
\begin{aligned}
\sin r &= \sin 2\pi N_{k+1} \\
\cos a &= \cos 2(k, k+1) \\
\cos b &= \sin 2(k, k+1) \\
\cos c &= 0
\end{aligned}
\qquad (31)
$$

If the point $\boldsymbol{S}=\boldsymbol{P}$, $\boldsymbol{Q}=\boldsymbol{K}=0$, be chosen as the pole of the sphere, the plane $\boldsymbol{S}=0$ will be the equatorial plane. Letting l represent the latitude and m the longitude of a point on the sphere, then:

$$
\sin l = \frac{\boldsymbol{S}}{\boldsymbol{P}} = \frac{2e}{1+e^2} \qquad \operatorname{tg} m = \frac{\boldsymbol{K}}{\boldsymbol{Q}} = \operatorname{tg} 2\theta \qquad (32)
$$

or,

$$
e = \operatorname{tg} \tfrac{1}{2} l \qquad m = 2\theta
$$

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Any definite elliptically polarized light is, therefore, represented by a definite point on a Poincaré Sphere. Its ellipticity is determined by the latitude of the point, and its azimuth by the longitude. Points on the same circle of longitude represent light of the same azimuth but varying ellipticity. Points on the circle of zero longitude represent light of zero azimuth. Points on the same circle of latitude represent light of the same ellipticity but varying azimuth. Points on the equator represent plane polarized light. Ellipticities equal but opposite in sign are represented by latitudes equal but opposite in sign.

If a given latitude, l, on the sphere, be said to correspond to a given ellipticity, e, when $e=\text{tg}\frac{1}{2}l$, and a given longitude, m, to correspond to a given azimuth, θ, when $m=2\theta$, any elliptically polarized light is represented by the point on the Poincaré Sphere of corresponding latitude and longitude. The effect of a doubly refracting plate may then be stated as follows:

A doubly refracting plate turns the Poincaré Sphere about an axis in its equator whose longitude corresponds to the azimuth of the plate, through an angle equal to the order of the plate expressed in degrees.

A plate with rotary power, on the other hand, evidently turns the Poincaré Sphere about its pole as an axis.

Since a series of rotations is itself a rotation, the effect of any number of doubly refracting plates is evidently equivalent to the effect of a single doubly refracting plate and a plate with rotary power.

A sphere constructed to show these relations has proven a great convenience in tracing the effects of doubly refracting plates, and in checking the results of the various formulae. The sphere is mounted, free to rotate about an axis in its equatorial plane, the axis in turn being movable in longitude. The sphere is provided with three circles: a circle of latitude, a circle of longitude and a circle to measure the rotation about its axis. The latitude circle is graduated directly in ellipticity instead of degrees. The longitude circle is graduated in double degrees, to read azimuths directly. The circle for measuring rotation is graduated directly in orders of doubly refracting plates. To ob-

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tain the effect of a doubly refracting plate upon any elliptically polarized light, it is only necessary to place the axis of the sphere at the azimuth of the plate, locate on the sphere by means of the latitude and longitude circles the point corresponding to the incident light and rotate the sphere through an angle equal to the order of the plate. The new readings given by the point on the latitude and longitude circles then show directly the ellipticity and azimuth of the emergent light.

APPLICATIONS OF THE THEOREM

6. The Effect of a Single Plate

The incident light is referred to its major and minor axes, and the angle between its major axis and the plane of the ordinary vibration in the plate is θ_o.

$$\begin{aligned} P_o &= P_o \\ Q_o &= P_o \frac{1-e_o^2}{1+e_o^2} \\ K_o &= 0 \\ S_o &= P_o \frac{2e_o}{1+e_o^2} \end{aligned} \tag{16}$$

$$\begin{aligned} P_1 &= P_o \\ Q_1 &= P_o \frac{1-e_o^2}{1+e_o^2} \cos 2\theta_o \\ K_1 &= P_o \frac{1-e_o^2}{1+e_o^2} \sin 2\theta_o \cos 2\pi N_1 + P_o \frac{2e_o}{1+e_o^2} \sin 2\pi N_1 \\ S_1 &= -P_o \frac{1-e_o^2}{1+e_o^2} \sin 2\theta_o \sin 2\pi N_1 + P_o \frac{2e_o}{1+e_o^2} \cos 2\pi N_1 \end{aligned} \tag{33}$$

If the incident light is plane polarized, $e_o = 0$ and $S_o = 0$, and the equations reduce to:

$$\begin{aligned} P_1 &= P_o \\ Q_1 &= P_o \cos 2\theta_o \\ K_1 &= P_o \sin 2\theta_o \cos 2\pi N_1 \\ S_1 &= -P_o \sin 2\theta_o \sin 2\pi N_1 \end{aligned} \tag{34}$$

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The direction of the major axis of the resultant ellipse is given by (22)

$$\operatorname{tg} 2\theta_1 = \frac{K_1}{Q_1} = \operatorname{tg} 2\theta_o \cos 2\pi N_1 \tag{35}$$

and its ellipticity by (23),

$$e_1 = -\frac{P_1 - \sqrt{P_1^2 - S_1^2}}{S_1} = -\frac{1 - \sqrt{1 - \sin^2 2\theta_o \sin^2 2\pi N_1}}{\sin 2\theta_o \sin 2\pi N_1} \tag{36}$$

This may be expanded:

$$e_1 = -\tfrac{1}{2} \sin 2\theta_o \sin 2\pi N_1 (1 + \tfrac{1}{4} \sin^2 2\theta_o \sin^2 2\pi N_1 + \ldots) \tag{37}$$

If N_1 is very small:

$$e_1 = -\pi N_1 \sin 2\theta_o \tag{38}$$

If $\theta_o = 45°$:

$$e_1 = -\frac{1 - \cos 2\pi N_1}{\sin 2\pi N_1} = -\operatorname{tg} \pi N_1 \tag{39}$$

which is the maximum ellipticity which can be produced in plane polarized light by the plate.

7. Stokes's Elliptic Analyzer

Stokes[1] compensates for the ellipticity of the incident light in two positions of the compensator, and in both positions extinguishes with a nicol.

Emerging from the compensator the light is plane polarized, therefore from (33):

$$S_1 = -P_o \frac{1 - e_o^2}{1 + e_o^2} \sin 2\theta_o \sin 2\pi N_1 + P_o \frac{2e_o}{1 + e_o^2} \cos 2\pi N_1 = 0$$

From which:

$$\frac{2e_o}{1 - e_o^2} = \sin 2\theta_o \operatorname{tg} 2\pi N_1 \tag{40}$$

The position of the nicol is determined by the plane of polarization of the compensated light. From (22) and (33):

[1] Stokes, G. G. *Phil. Mag.* (4), vol. 2, pp. 420–21, 1851.

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$$\operatorname{tg} 2\theta_1 = \frac{K_1}{Q_1} = \frac{P_o \frac{1-e_o^2}{1+e_o^2} \sin 2\theta_o \cos 2\pi N_1 - P_o \frac{2e_o}{1+e_o^2} \sin 2\pi N_1}{P_o \frac{1-e_o^2}{1+e_o^2} \cos 2\theta_o}$$

Substituting the value of $\frac{2e_o}{1-e_o^2}$ and simplifying:

$$\operatorname{tg} 2\theta_1 = \frac{\operatorname{tg} 2\theta_o}{\cos 2\pi N_1}$$

$$\cos 2\pi N_1 = \frac{\operatorname{tg} 2\theta_o}{\operatorname{tg} 2\theta_1}$$

Letting $e_o = \operatorname{tg} \omega$,

$$\cos 2\omega = \frac{1-e_o^2}{1+e_o^2} = \frac{1}{\sqrt{\left[\frac{2e_o}{1-e_o^2}\right]^2 + 1}}$$

Substituting values for $\frac{2e_o}{1-e_o^2}$ and for $\operatorname{tg} 2\pi N_1$:

$$\cos 2\omega = \frac{\cos 2\theta_1}{\cos 2\theta_o}$$

Using Stokes's notation:

$$\begin{aligned} r' - r &= \frac{\pi}{2} - 2\theta_1 = \frac{\pi}{2} - 2r = n \\ R' - R &= \frac{\pi}{2} - 2\theta_o = \frac{\pi}{2} - 2R = c \end{aligned} \tag{41}$$

and the equations reduce to Stokes's form:

$$\cos 2\omega = \frac{\sin(r'-r)}{\sin(R'-R)} = \frac{\sin n}{\sin c} \qquad \cos 2\pi N_1 = \frac{\operatorname{tg}(r'-r)}{\operatorname{tg}(R'-R)} = \frac{\operatorname{tg} n}{\operatorname{tg} c} \tag{42}$$

or in another form usually more convenient for computation:

$$\operatorname{tg} \omega = e_o = \sqrt{\frac{\operatorname{tg} \tfrac{1}{2}(c-n)}{\operatorname{tg} \tfrac{1}{2}(c+n)}} \qquad \operatorname{tg} \pi N_1 = \sqrt{\frac{\sin(c-n)}{\sin(c+n)}} \tag{43}$$

In introducing Stokes's notation it is assumed that the two readings of the compensator are complementary when the major axis of the original ellipse is taken as the axis of reference. Care must be taken to choose two out of the possible four sets of read-

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ings, such that this is the case, since otherwise the final formulae will give the reciprocals of $\mathrm{tg}\,\omega$ and $\mathrm{tg}\,\pi N_1$, instead of the quantities themselves. To insure the proper choice it is necessary that

$$\frac{\cos(c-n)}{\cos 2\pi N_1} > 0$$

If N_1 is not known beforehand with sufficient accuracy to determine the sign of $\cos 2\pi N_1$, the direction of the major axis of the ellipse must be determined roughly by some independent method.

If the order of the compensator, N_1, is accurately known in advance, it is not necessary to read both compensator and nicol, the reading of either one alone being sufficient to determine the ellipticity of the incident light. The following equations are readily obtained:

$$\mathrm{tg}\,2\omega = \mathrm{tg}\,2\pi N_1 \cos c \qquad (44)$$

and

$$\sin 2\omega = \sin 2\pi N_1 \cos n \qquad (45)$$

For small ellipticities the first equation is preferable, and for large, the second.

The equations so far have been given in terms of the rotation of the nicol relative to the compensator. It is sometimes convenient to read the rotation of the nicol relative to fixed axes. Calling ρ and ρ' the two rotations of the nicol relative to fixed axes, and ν their difference:

$$\rho = R - r \qquad \rho' = R' - r' = r - R$$

$$\nu = \rho' - \rho = 2(r - R) = c - n$$

Eliminating $(c+n)$ between the equations:

$$\mathrm{tg}\,\omega = e_o = \sqrt{\frac{\mathrm{tg}\,\tfrac{1}{2}(c-n)}{\mathrm{tg}\,\tfrac{1}{2}(c+n)}} \quad \text{and} \quad \mathrm{tg}\,\pi N_1 = \sqrt{\frac{\sin(c-n)}{\sin(c+n)}} \qquad (43)$$

the following equation is obtained:

$$\mathrm{tg}\,\omega = e_o = \sqrt{\frac{1-\cos\nu}{\mathrm{tg}^2\pi N_1 \left\{1 \pm \sqrt{1 - \frac{\sin^2\nu}{\mathrm{tg}^4\pi N_1}}\right\}}} \qquad (46)$$

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where the upper or lower sign is taken according as $\cos\nu$ is positive or negative, i.e. according as $\cos 2\pi N_1$ is positive or negative.

None of the preceding equations involving the double rotation of compensator and nicol determine the sign of e_o since they are all affected by an ambiguity of sign. To determine the sign of e_o it is necessary to use the equation:

$$\frac{2e_o}{1-e_o^2}=\operatorname{tg} 2\omega=\sin 2\theta_o \operatorname{tg} 2\pi N_1=\sin 2R \operatorname{tg} 2\pi N_1 \qquad (40)$$

giving $\sin 2\theta_o$ and $\operatorname{tg} 2\pi N_1$ their proper signs.

The direction of the major axis of the ellipse is evidently given by either $\frac{1}{2}(\rho+\rho')$, or $\frac{1}{2}(R+R')-\frac{\pi}{4}$.

8. Halfshade Analyzing Systems

These will be discussed under two types: *Type A* and *Type B*. In *Type A* the two halves of the halfshade consist of analyzers whose principal azimuths make a slight angle with each other. In *Type B* the two halves consist of doubly refracting plates whose principal azimuths are the same but whose orders are different. The light emerging from the plates is analyzed by a nicol.

Type A.

Lippich Half Nicol.[1]
Brace Sensitive Strip.[2]
Jellett Split Prism.[3]
Cornu-Jellett Split Nicol.[4]
Lippich Split Nicol.[1]

[1] Lippich, F. *Naturwiss. Jahrbuch "Lotos,"* vol. 2, 1880; *Wien. Ber.*, vol. 85, pp. 268–326, 1882; *Ztschr. f. Instk.*, vol. 2, pp. 167–74, 1882; *Wien. Ber.*, vol. 91, pp. 1059–96, 1885; *Ztschr. f. Instk.*, vol. 12, pp. 333–42, 1892; *Ztschr. f. Instk.*, vol. 14, pp. 326–27, 1894; *Wien. Ber.*, vol. 105, pp. 317–61, 1896.

[2] Brace, D. B. *Phil. Mag.* (6), vol. 5, pp. 161–69, 1903.

[3] Jellett, J. H. *Brit. Assoc. Report*, vol. 2, p. 13, 1860.

[4] Cornu, Alfred. *Bull. de la Soc. Chim.*, vol. 14, p. 140, 1870.

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Soleil Biquartz.[1]
Poynting Biquartz.[2]
Poynting Sugar Cell.[2]

Of these halfshade analyzing systems, all except the last three analyze the light in two directions making a slight angle with each other. The last three do not properly come under the general theory here given, but an elementary consideration shows that the emergent intensities are the same as if the biquartz or sugar cell were removed and the two halves of the analyzing nicol rotated in the opposite direction through the same angles as those produced by the rotation of the quartz or sugar. The theory is then identical (for monochromatic light) with that of the split nicols.

In the first two systems, the intensities of the emergent light when the incident light is unpolarized are not the same but have the ratio $1-\kappa$ where:

$$\kappa=\sin^2(1,1')+\kappa_0\cos^2(1,1')$$

$\measuredangle(1,1')$ being the angle between the two halves of the analysing system, and $1-\kappa_0$, the ratio when $\measuredangle(1,1')=0$. For the Brace Sensitive Strip $\kappa_0=0$, and for the Lippich half nicol $\kappa_0=.08$. The theory of the other systems may be obtained from that of the first two by making $\kappa=0$.

Referring the incident light to its major axis (16):

$$\boldsymbol{P}_0=\boldsymbol{P}_0$$

$$\boldsymbol{Q}_0=\boldsymbol{P}_0\frac{1-e^2_0}{1+e^2_0}$$

For a match of intensity of the two halves of the field:

$$\boldsymbol{P}_1+\boldsymbol{Q}_1=(1-\kappa)(\boldsymbol{P}'_1+\boldsymbol{Q}'_1)$$

or from (11)

$$\boldsymbol{P}_0+\boldsymbol{P}_0\frac{1-e^2_0}{1+e^2_0}\cos 2(0,1)=(1-\kappa)\left[\boldsymbol{P}_0+\boldsymbol{P}_0\frac{1-e^2_0}{1+e^2_0}\cos 2(0,1')\right]$$

[1] Soleil, ——. *C. R.*, vol. 20, p. 1805, 1845.
[2] Poynting, J. H. *Phil. Mag.* (5), vol. 10, pp. 18–21, 1880.

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which reduces to

$$\kappa+\frac{1-e_0^2}{1+e_0^2}[\cos 2(0,1)-(1-\kappa)\cos 2(0,1')]=0$$

Writing $(0,1)=(0,1')-(1,1')$, expanding and collecting terms:

$$\frac{1+e_0^2}{1-e_0^2}\kappa-[1-\kappa-\cos 2(1,1')]\cos 2(0,1')+\sin 2(1,1')\sin 2(0,1')=0$$

Writing $e_0=\operatorname{tg}\omega$ and solving for $\cos 2(0,1')$ and $\sin 2(0,1')$, this gives after some reduction:

$$\begin{aligned}\cos 2(0,1')&=+\frac{a\sec 2\omega-b\sqrt{c-\operatorname{tg}^2 2\omega}}{c+1}\\ \sin 2(0,1')&=-\frac{b\sec 2\omega+a\sqrt{c-\operatorname{tg}^2 2\omega}}{c+1}\end{aligned}\qquad(47)$$

where

$$a=\frac{1}{\kappa}[1-\kappa-\cos 2(1,1')]$$

$$b=\frac{1}{\kappa}\sin 2(1,1')$$

$$c=\frac{2}{\kappa^2}(1-\kappa)[1-\cos 2(1,1')]=4(1-\kappa_0)\frac{\sin^2 2(1,1')}{[(1+\kappa_0)-(1-\kappa_0)\cos 2(1,1')]^2}$$

$$a^2+b^2=c+1$$

If $(0,1')=(0,1')_0$ for $e_0=0$, and $\alpha=(0,1')-(0,1')_0$: where α represents the error in setting when ellipticity is present.

$$\sin 2\alpha=\frac{\sqrt{c}\sec 2\omega-\sqrt{c-\operatorname{tg}^2 2\omega}}{c+1}\qquad(48)$$

Substituting $e_0=\operatorname{tg}\omega$ and expanding in ascending powers of e_0,

$$\begin{aligned}\sin 2\alpha=&\frac{2}{\sqrt{c}}e^2{}_0+\frac{2}{\sqrt{c}}\frac{c+1}{c}e^4{}_0+\frac{2}{\sqrt{c}}\frac{(c+1)^2+1}{c^2}e^6{}_0\\&+\frac{2}{\sqrt{c}}\frac{(c+1)^3+3(c+1)}{c^3}e^8{}_0\\&+\frac{2}{\sqrt{c}}\frac{(c+1)^4+10(c+1)^2+2(c+1)+1}{c^4}e^{10}{}_0+\ldots.\end{aligned}\qquad(49)$$

If $\kappa=0$, $c=\infty$ and $\alpha=0$ for all values of e_0. It is evident that if $\kappa=0$, the setting is independent of the ellipticity of the incident

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light, and depends only on the azimuth of its major axis, the minor axis always bisecting the angle between the principal azimuths of the two halves of the analyzing system. If $\kappa \neq 0$ the setting depends not only on the azimuth of the major axis, but also upon the ellipticity of the incident light. The series for $\sin 2\alpha$ is rapidly convergent, and for small values of e_o and κ may be written:

$$\alpha = \frac{1}{\sqrt{c}} e^2_o \qquad (50)$$

Or expressed in degrees:

$$\alpha^\circ = ke^2_o$$

$$= \frac{1}{1{,}745 \times 10^{-2} \sqrt{c}} e^2_o$$

$$= \frac{1}{3{,}49 \times 10^{-2} \sqrt{1-\kappa_o}} \frac{(1+\kappa_o)-(1-\kappa_o)\cos 2(1,1')}{\sin 2(1,1')} e^2_o$$

The coefficient k is infinite for $\measuredangle(1,1')=0$, falls to a minimum for

$$\cos 2(1,1') = \frac{1-\kappa_o}{1+\kappa_o}.$$

and then rises again as $\measuredangle(1,1')$ increases. For the Lippich half nicol this minimum, $\measuredangle(1,1')=15.8°$, lies outside the range of practical use. The series is, of course, not convergent for large values of k, but it gives sufficiently accurate results for all practical values of $\measuredangle(1,1')$. The value of k, for the Lippich half nicol ($\kappa_o=.08$) is plotted in the curve, figure 2. Plotted on the same scale, the value of k, for the Brace sensitive strip ($\kappa_o=0$) could not be distinguished from the axis of abscissae. For the Brace sensitive strip α is negligible, but for the Lippich half nicol it may be appreciable in accurate work even with small ellipticities. If $\measuredangle(1,1')=1°$ and $e_o=.0085$, then $\alpha=.01°$, the error introduced by neglecting it being greater for smaller values of $\measuredangle(1,1')$ and larger values of e_o. Care must therefore be taken in using the Lippich half nicol to ensure the absence of ellipticity, or, if present, to eliminate the error produced by it. In measurements on naturally rotating substances this error can only be eliminated by reversing the angle between the two halves of the field [changing

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the sign of the angle (1,1′) changes the sign of k]. In measurements on magnetic or electrical rotation, it may also be eliminated

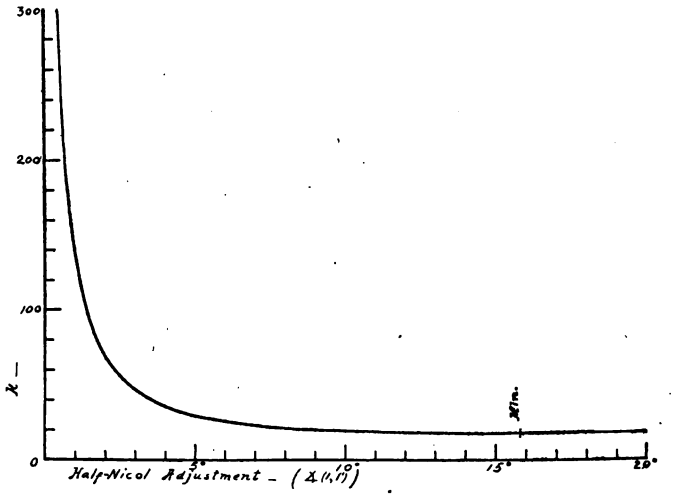

Fig. 2

by reversing the rotation. If the effects are measured along the lines of force, the rotation is reversed by reversing the field. If the effects are measured at right angles to the lines of force the rotation can only be reversed by rotating either the field or the optical system through 90°.

Type B.

Bravais Biplate.[1]

Brace Elliptic Halfshade.[2]

Laurent Saccharimeter Halfshade.[3]

The Bravais Biplate consists of two halves of a doubly refract-

[1] Bravais, A. *Ann. de Chim. et de Phys.* (3), vol. 43, pp. 131–35, 1855.

[2] Brace, D. B. *Phys. Rev.*, vol. 18, pp. 70–88, 1904; *Phys. Rev.*, vol. 19, pp. 218–30, 1904.

[3] Laurent, L. *Dingler Journ.*, vol. 223, pp. 608–14, 1877; *C. R.*, vol. 89, pp. 665–67, 1879.

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ing plate whose order is approximately ¼, mounted edge to edge with an angle of 90° between their principal azimuths. It may be considered as composed of two halves whose principal azimuths are the same and whose orders are equal but of opposite sign.

The Brace Elliptic Halfshade consists of a thin piece of mica covering only half the field, and mounted in balsam between carefully selected cover glasses, free from double refraction.

The Laurent Saccharimeter Halfshade consists of a doubly refracting plate whose order is ½ for some selected wave-length (usually the *D* line of sodium) and covering half the field. In its best form, it is either mounted in a medium of the same average refractive index, or the other half of the field is covered by a glass plate of the same average index.

All three may be considered as special cases of a halfshade whose two halves have the same principal azimuth, but different orders, and which transmit the same amount of unpolarized light. The emergent light is analyzed by a nicol.

If the incident light is referred to its major and minor axes, the angle between the major axis and the principal azimuth of the halfshade being $\measuredangle(0,1)$, between the halfshade and nicol $\measuredangle(1,2)$, and the orders of the two halves of the halfshade, N_1 and N'_1, the following equations result:

$$\begin{aligned} P_o &= P_o \\ Q_o &= P_o \frac{1-e^2_o}{1+e^2_o} \\ K_o &= 0 \\ S_o &= P_o \frac{2e_o}{1+e^2_o} \end{aligned} \qquad (16)$$

For a match of intensity of the two halves of the field:

$$P_2+Q_2=P'_2+Q'_2$$

Since

$$P_2=P'_2=P_o, \qquad Q_2-Q'_2=0$$

or, from (14)

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$$P_o \frac{1-e_o^2}{1+e_o^2}\begin{vmatrix} +\cos 2(o,1)\cos 2(1,2) \\ -\sin 2(o,1)\sin 2(1,2)\cos 2\pi N_1 \end{vmatrix}$$

$$+P_o \frac{2e_o}{1+e_o^2}\sin 2(1,2)\sin 2\pi N_1$$

$$-P_o \frac{1-e_o^2}{1+e_o^2}\begin{vmatrix} +\cos 2(o,1)\cos 2(1,2) \\ -\sin 2(o,1)\sin 2(1,2)\cos 2\pi N'_1 \end{vmatrix}$$

$$-P_o \frac{2e_o}{1+e_o^2}\sin 2(1,2)\sin 2\pi N'_1 \qquad =o$$

Dividing through by $P_o \frac{1-e_o^2}{1+e_o^2}$ cancelling like terms and putting

$$\frac{2e_o}{1-e_o^2} = \operatorname{tg} 2\omega = t$$

$$\sin 2(1,2)\begin{vmatrix} \sin 2(o,1)(\cos 2\pi N_1 - \cos 2\pi N'_1) \\ -t(\sin 2\pi N_1 - \sin 2\pi N'_1) \end{vmatrix} = o$$

If $\sin 2(1,2)=o$, it is a match for all values of t, N_1, N'_1 and $\measuredangle(o,1)$, hence the system is useless. If $\sin 2(1,2)\neq o$:

$$\sin 2(o,1)(\cos 2\pi N_1 - \cos 2\pi N'_1) - t(\sin 2\pi N_1 - \sin 2\pi N'_1) = o$$

Writing $N = \frac{1}{2}(N_1 + N'_1)$, $\Delta N = \frac{1}{2}(N_1 - N'_1)$, expanding, collecting terms and dividing by $-\cos 2\pi N \sin 2\pi \Delta N$:

$$t + \sin 2(o,1).\operatorname{tg} 2\pi N = o \qquad (52)$$

It is evident that, with a known average order, N, of the halfshade, a match enables one to determine the ellipticity of the incident light provided the azimuth of its major axis be known, and conversely to determine the azimuth of its major axis provided its ellipticity be known.

In measuring ellipticities such a system will give a match only when $t < \operatorname{tg} 2\pi N$, but since in measuring ellipticities a compensator is always used to increase the sensibility, this limitation is of no significance.

Balanced Halfshades.—A balanced halfshade is defined as one in which $N=o$ and therefore $\operatorname{tg} 2\pi N = o$. Such a halfshade is especially convenient from a theoretical standpoint, since it gives

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a match with plane polarized light ($t=0$) only, independent of the value of $\chi(0,1)$, and thereby greatly simplifies the formulae. The Bravais biplate when properly made is a balanced halfshade, but those made commercially do not always show perfect balance. This quality would make the Bravais biplate preferable to the Brace halfshade, were it not for the greatly increased sensibility obtainable with the latter (see discussion of sensibility, section 10). Experiments are now in progress with a view to producing a balanced Brace halfshade.

Laurent Saccharimeter Halfshade.—If as a special case $e_o=0$, then $t=0$ and the light is plane polarized. In case $\operatorname{tg} 2\pi N \neq 0$, a match is obtained only when $\sin 2(0,1)=0$. This is the condition of the Laurent Saccharimeter halfshade. It is evidently useful only when it is known that the solution investigated introduces no ellipticity, unless the plate should be an achromatic half-wave plate.

9. Elliptic Halfshade Systems With Compensator

The halfshade may be either a Bravais biplate or a Brace elliptic halfshade. The compensator may be any plane parallel doubly refracting plate, preferably one whose order, $N<\frac{1}{4}$, because of the greater chromatic dispersion of higher orders. For use with the Brace elliptic halfshade, the Brace compensator is preferable because its chromatic dispersion is proportional to that of the halfshade. The Brace compensator is constructed like the halfshade, but the piece of mica covers the whole field instead of only one-half.

Two arrangements will be considered:

A. ⇒ *Elliptic Halfshade* ⇒ *Compensator* ⇒ *Nicol.*

B. ⇒ *Compensator* ⇒ *Elliptic Halfshade* ⇒ *Nicol.*

For a match of intensity of the two halves of the field:

$$\boldsymbol{P}_3+\boldsymbol{Q}_3=\boldsymbol{P}'_3+\boldsymbol{Q}'_3$$

But since in general, $\boldsymbol{P}_3=\boldsymbol{P}'_3=\boldsymbol{P}_o$, $\boldsymbol{Q}_3=\boldsymbol{Q}'_3$.

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The formal difference between Q_3 and Q'_3 lies wholly in the difference of thickness of the two halves of the halfshade. No generality is lost by referring the incident light to its major and minor axes. Then from the general equations: (15) and (16)

$$P_o = P_o$$

$$Q_o = P_o \frac{1-e^2_o}{1+e^2_o}$$

$$K_o = 0$$

$$S_o = P_o \frac{2e_o}{1+e^2_o}$$

and

$$Q_3 = P_o \frac{1-e^2_o}{1+e^2_o} \begin{vmatrix} +\cos 2(0,1)\cos 2(1,2)\cos 2(2,3) & \\ -\cos 2(0,1)\sin 2(1,2)\sin 2(2,3) \;.\;.\;.\;.\; & \cos 2\pi N_2 \\ -\sin 2(0,1)\sin 2(1,2)\cos 2(2,3) & \cos 2\pi N_1 \\ -\sin 2(0,1)\cos 2(1,2)\sin 2(2,3) & \cos 2\pi N_1 \cos 2\pi N_2 \\ +\sin 2(0,1) \;.\;.\;.\;.\; & \sin 2(2,3) \sin 2\pi N_1 \sin 2\pi N_2 \end{vmatrix} \tag{53}$$

$$+ P_o \frac{2e_o}{1+e^2_o} \begin{vmatrix} +\sin 2(1,2)\cos 2(2,3)\sin 2\pi N_1 & \\ +\cos 2(1,2)\sin 2(2,3)\sin 2\pi N_1 & \cos 2\pi N_2 \\ +\;.\;.\;.\;.\; & \sin 2(2,3)\cos 2\pi N_1 \sin 2\pi N_2 \end{vmatrix}$$

A. ➽ *Elliptic Halfshade* ➽ *Compensator* ➽ *Nicol*

For this arrangement the symbols have the following significance:

Order of the one half of halfshade $= N_1$
Order of other half of halfshade $= N'_1$
Order of compensator $= N_2$
Angle between major axis of incident light and principal azimuth of halfshade $= \measuredangle(0,1)$
Angle between halfshade and compensator $= \measuredangle(1,2)$
Angle between compensator and nicol $= \measuredangle(2,3)$

This arrangement is useful in measuring small ellipticities with a compensator of low order, since it enables the halfshade to be conveniently placed relatively farther from the observing telescope and is easily applied to the ordinary polariscope.

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For a match, $Q_3 - Q'_3 = 0$, or

$$P_o \frac{1-e_o^2}{1+e_o^2} \begin{vmatrix} -\sin 2(0,1) \sin 2(1,2) \cos 2(2,3) \ldots\ldots (\cos 2\pi N_1 - \cos 2\pi N'_1) \\ -\sin 2(0,1) \cos 2(1,2) \sin 2(2,3) \cos 2\pi N_2 \ (\cos 2\pi N_1 - \cos 2\pi N'_1) \\ +\sin 2(0,1) \ldots\ldots \sin 2(2,3) \sin 2\pi N_2 \ (\sin 2\pi N_1 - \sin 2\pi N'_1) \end{vmatrix}$$

$$+ P_o \frac{2e_o}{1+e_o^2} \begin{vmatrix} +\sin 2(1,2) \cos 2(2,3) \ldots\ldots (\sin 2\pi N_1 - \sin 2\pi N'_1) \\ +\cos 2(1,2) \sin 2(2,3) \cos 2\pi N_2 (\sin 2\pi N_1 - \sin 2\pi N'_1) \\ +\ldots\ldots \sin 2(2,3) \sin 2\pi N_2 (\cos 2\pi N_1 - \cos 2\pi N'_1) \end{vmatrix} = 0$$

Substituting $N_1 = N + \Delta N$, $N'_1 = N - \Delta N$, expanding, canceling like terms and dividing by $2 P_o \frac{1-e_o^2}{1+e_o^2} \cos 2\pi N \sin 2\pi \Delta N$, since $\sin 2\pi \Delta N = 0$ would give a match for any value of e_o and hence a useless system:

$$\sin 2(0,1) \begin{vmatrix} +\sin 2(1,2) \cos 2(2,3) \operatorname{tg} 2\pi N \\ +\cos 2(1,2) \sin 2(2,3) \operatorname{tg} 2\pi N \cos 2\pi N_2 \\ +\ldots\ldots \sin 2(2,3) \ldots\ldots \sin 2\pi N_2 \end{vmatrix} \qquad (54)$$

$$+ \frac{2e_o}{1-e_o^2} \begin{vmatrix} +\sin 2(1,2) \cos 2(2,3) \\ +\cos 2(1,2) \sin 2(2,3) \ldots\ldots \cos 2\pi N_2 \\ -\ldots\ldots \sin 2(2,3) \operatorname{tg} 2\pi N \sin 2\pi N_2 \end{vmatrix} = 0$$

If the halfshade is balanced, $\operatorname{tg} 2\pi N = 0$ and:

$$\sin 2(0,1) \sin 2(2,3) \sin 2\pi N_2$$

$$+ \frac{2e_o}{1-e_o^2} \begin{vmatrix} +\sin 2(1,2) \cos 2(2,3) \\ +\cos 2(1,2) \sin 2(2,3) \cos 2\pi N_2 \end{vmatrix} = 0$$

Or

$$\frac{2e_o}{1-e_o^2} = -\frac{\sin 2(0,1) \sin 2(2,3) \sin 2\pi N_2}{\sin 2(1,3) \cos 2\pi N_2 + \sin 2(1,2) \cos 2(2,3)(1-\cos 2\pi N_2)} \qquad (55)$$

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For low values of the compensator (N_2 small) this may be expanded in a series provided sin 2(1,3) is not too small.

$$\frac{2e_o}{1-e_o^2}=-\frac{\sin 2(0,1)\sin 2(2,3)}{\sin 2(1,3)}\operatorname{tg} 2\pi N_2\left\{1-\frac{\sin 2(1,2)\cos 2(2,3)}{\sin 2(1,3)}\cdot\frac{1-\cos 2\pi N_2}{\cos 2\pi N_2}+\cdots\right\}$$

For maximum sensibility the nicol should be set for minimum intensity of the transmitted light. If e_o is small this is approximately at 90° to the major axis of the original ellipse, so that the nicol may be set at 90° with no appreciable loss of sensibility. If this be done, $\measuredangle(0,3)=90°$ and $\sin 2(0,1)=\sin 2(1,3)$. Writing $\measuredangle(1,3)=\alpha$, and $\measuredangle(2,3)=\psi$, where ψ measures the rotation of the compensator:

$$\frac{2e_o}{1-e_o^2}=-\sin 2\psi\operatorname{tg} 2\pi N_2\left\{1-\frac{\sin 2(\alpha-\psi)\cos 2\psi}{\sin 2\alpha}\cdot\frac{1-\cos 2\pi N_2}{\cos 2\pi N_2}+\cdots\right\}$$

or

$$e_o=-\operatorname{tg}\pi N_2\sin 2\psi\frac{1-e_o^2}{1-\operatorname{tg}^2\pi N_2}\left\{1-\frac{\sin 2(\alpha-\psi)\cos 2\psi}{\sin 2\alpha}\cdot\frac{1-\cos 2\pi N_2}{\cos 2\pi N_2}+\cdots\right\}$$

Substituting in $1-e_o^2$ the approximate value, $e_o=-\operatorname{tg}\pi N_2\sin 2\psi$, and expanding in a series to quantities of the second order in N_2

$$e_o=-\operatorname{tg}\pi N_2\sin 2\psi\left[1-\operatorname{tg}^2\pi N_2(\cos^2 2\psi-\cot 2\alpha\sin 4\psi)+\cdots\right] \quad (56)$$

For any given value of α, the maximum value of

$$\cos^2 2\psi-\cot 2\alpha\sin 4\psi \text{ is } \tfrac{1}{2}(1+\sqrt{1+4\cot^2 2\alpha}).$$

Then the approximate formula

$$e_o=-\operatorname{tg}\pi N_2\sin 2\psi \quad (57)$$

may be used provided $\tfrac{1}{2}(1+\sqrt{1+4\cot^2 2\alpha})\operatorname{tg}^2\pi N_2$ is negligible. The curve, figure 3, is plotted on the assumption of a maximum allowable error of 1 per cent. The abscissae represent the angle, α, between halfshade and nicol, while the ordinates give the corresponding maximum allowable order of the

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compensator, N_2. For an error not greater than 1 per cent, to be introduced by using the approximate formula (57), $2\pi N_2$ must not be greater than 11.5° in any case, and the further α lies from 45°, the smaller the allowable value. Since the angle be-

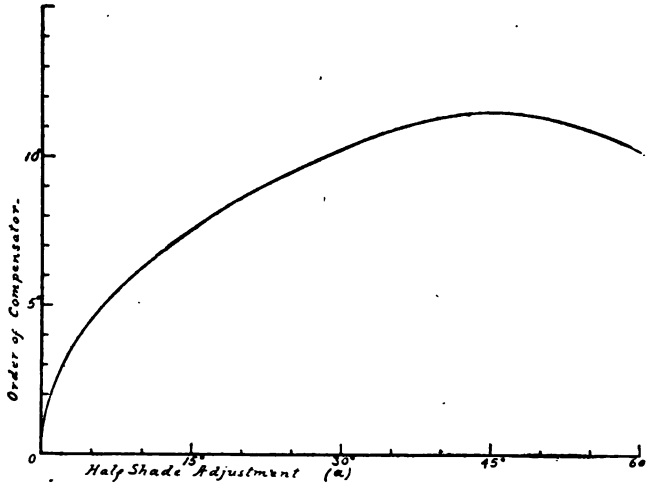

Fig. 3

tween halfshade and nicol regulates the sensibility of the system and is necessarily small for large values of ΔN, the approximate formula can only be used where ΔN is small enough to give satisfactory sensibility at 45°. For large values of ΔN, as in the Bravais biplate ($\Delta N = \frac{1}{4}$), the approximate formula is therefore not available, and it would be necessary, if this arrangement were used, to fall back upon the rigorous formula (55). As this involves the necessity of reading not only the compensator but also the halfshade rotation, it is preferable to use the arrangement *B*.

If the halfshade is not balanced, a conveniently usable formula can only be obtained when $\measuredangle(1,3)=45°$, *i.e.* when the halfshade is placed at 45° to the analyzing nicol. This of course requires a sufficiently low value of ΔN to give satisfactory sensibility. Letting $\measuredangle(0,1)=-\theta$, and $\measuredangle(2,3)=\psi$, then $\measuredangle(1,2)=\frac{\pi}{4}-\psi$ and the formula (54) reduces to

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$$\sin 2\theta \begin{vmatrix} +\cos^2 2\psi \operatorname{tg} 2\pi N & \\ +\sin^2 2\psi \operatorname{tg} 2\pi N \cos 2\pi N_2 & \\ +\sin 2\psi \quad . \quad . \quad . \quad . & \sin 2\pi N_2 \end{vmatrix}$$

$$-\frac{2e_o}{1-e_o^2} \begin{vmatrix} +\cos^2 2\psi & \\ +\sin^2 2\psi \quad . \quad . \quad . \quad . & \cos 2\pi N_2 \\ -\sin 2\psi \operatorname{tg} 2\pi N & \sin 2\pi N_2 \end{vmatrix} = 0$$

Substituting $1-\sin^2 2\psi$ for $\cos^2 2\psi$, $2\sin^2 \pi N_2$, for $1-\cos 2\pi N_2$, collecting terms and solving for $\frac{2e_o}{1-e_o^2}$.

$$\frac{2e_o}{1-e_o^2} = \sin 2\theta \frac{\operatorname{tg} 2\pi N + \sin 2\pi N_2 \sin 2\psi - 2\sin^2 \pi N_2 \operatorname{tg} 2\pi N \sin^2 2\psi}{1-\sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi} \quad (58)$$

If the ellipticity of the incident light is zero, the numerator of this expression is zero, from which:

$$\operatorname{tg} 2\pi N = -\sin 2\pi N_2 \sin 2\psi + 2\sin^2 \pi N_2 \operatorname{tg} 2\pi N \sin^2 2\psi \quad (59)$$

where the second term may usually be neglected. Or

$$\operatorname{tg} 2\pi N = -\frac{\sin 2\pi N_2 \sin 2\psi}{1-2\sin^2 \pi N_2 \sin^2 2\psi} \quad (60)$$

which may be expanded in a series:

$$\operatorname{tg} 2\pi N = -\sin 2\pi N_2 \sin 2\psi (1 + 2\sin^2 \pi N_2 \sin^2 2\psi + 4\sin^4 \pi N_2 \sin^4 2\psi + \ldots) \quad (61)$$

This is the condition of the apparatus in the work done by Elmén,[1] Morse,[2] Hagenow,[3] and McComb,[4] on the electric double refraction of liquids. In their work the electric field is placed parallel to the principal azimuth of the halfshade, so that the liquid may be considered as part of the halfshade. N then represents the retardation of the liquid plus the average order of the mica halfshade itself.

[1] Elmén, G. W. *Phys. Rev.*, vol. 20, p. 54, 1905.
[2] Morse, L. B. *Phys. Rev*, vol. 23, p. 252, 1906.
[3] Hagenow, C. F. *Phys. Rev.*, vol. 27, p. 196, 1908.
[4] McComb, H. E. *Phys. Rev.*, vol. 27, p. 336, 1908.

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If $e \neq 0$, let $\psi = \psi_o$ for the setting on plane polarized light. Then from (59),

$$\operatorname{tg} 2\pi N = -\sin 2\pi N_2 \sin 2\psi_o + 2\sin^2 \pi N_2 \operatorname{tg} 2\pi N \sin^2 2\psi_o.$$

Substituting this in equation (58)

$$\frac{2e_o}{1-e^2_o} =$$

$$\sin 2\theta \frac{\sin 2\pi N_2(\sin 2\psi - \sin 2\psi_o) - 2\sin^2 \pi N_2 \operatorname{tg} 2\pi N(\sin^2 2\psi - \sin^2 2\psi_o)}{1 - \sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi}$$

$$= \sin 2\theta \sin 2\pi N_2(\sin 2\psi - \sin 2\psi_o) \cdot \frac{1 - \operatorname{tg} \pi N_2 \operatorname{tg} 2\pi N(\sin 2\psi + \sin 2\psi_o)}{1 - \sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi}$$

Or: $$e_o = \tfrac{1}{2} \sin 2\theta \sin 2\pi N_2(\sin 2\psi - \sin 2\psi_o)(1 - e^2_o) \cdot \frac{1 - \operatorname{tg} \pi N_2 \operatorname{tg} 2\pi N(\sin 2\psi + \sin 2\psi_o)}{1 - \sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi}$$

Substituting $\operatorname{tg} \pi N_2 \cos^2 \pi N_2 = \tfrac{1}{2} \sin 2\pi N_2$:

$$e_o = \sin 2\theta \operatorname{tg} \pi N_2(\sin 2\psi - \sin 2\psi_o)(1 - e^2_o) \cos^2 \pi N_2 \cdot \frac{1 - \operatorname{tg} \pi N_2 \operatorname{tg} 2\pi N(\sin 2\psi + \sin 2\psi_o)}{1 - \sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi} \qquad (62)$$

For all values of N and N_2 for which this arrangement is useful, the factor:

$$(1 - e^2_o) \cdot \cos^2 \pi N_2 \frac{1 - \operatorname{tg} \pi N_2 \operatorname{tg} 2\pi N(\sin 2\psi + \sin 2\psi_o)}{1 - \sin 2\pi N_2 \operatorname{tg} 2\pi N \sin 2\psi - 2\sin^2 \pi N_2 \sin^2 2\psi}$$

is a correction factor whose value is nearly 1. In it therefore, e_o and $\sin 2\psi_o$, may be replaced without sensible error by the approximate values:

$$e_o = \tfrac{1}{2} \sin 2\theta \sin 2\pi N_2(\sin 2\psi - \sin 2\psi_o)$$

$$\sin 2\psi_o = -\frac{\operatorname{tg} 2\pi N}{\sin 2\pi N_2}$$

and the factor expanded in a series according to ascending powers of $\sin 2\psi$. If this be done the factor is, to quantities of the second order in N and N_2:

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$$1+2\operatorname{tg}^2\pi N(1-\tfrac{1}{2}\sin^2 2\theta)-\sin^2\pi N_2+\tfrac{1}{2}\sin 2\pi N_2\operatorname{tg}2\pi N\cos^2 2\theta\sin 2\psi$$
$$+2\sin^2\pi N_2(1-\tfrac{1}{2}\sin^2 2\theta)\sin^2 2\psi$$

In practice, θ can not differ much from 45°, if the sensibility is satisfactory, so that in the correction factor, the assumption may be made: $\sin 2\theta=1$, $\cos 2\theta=0$. It then becomes:

$$1+\operatorname{tg}^2\pi N-\sin^2\pi N_2\cos^2 2\psi$$

The correction factor may be neglected if both $\operatorname{tg}^2\pi N$ and $\sin^2\pi N_2$ are negligible in comparison with 1. Then:

$$e_o=\sin 2\theta\operatorname{tg}\pi N_2(\sin 2\psi-\sin 2\psi_o) \qquad (63)$$

Since complementary values of ψ_o give the same value of $\sin 2\psi_o$, ψ_o is readily obtained by making two independent settings for a match on plane polarized light and subtracting ½ their sum from 90°.

The value of ψ_o may evidently be used (equation 61) to calibrate an unknown compensator in terms of a known halfshade and vice versa.

This is the arrangement and the formula used by Skinner and Tool[1] in their work on the optical properties of magnetic metals. In their work, $\sin 2\theta=1$.

B. ⇒ *Compensator* ⇒ *Elliptic Halfshade* ⇒ *Nicol*

For this arrangement the symbols have the following significance:

Order of compensator $=N_1$.
Order of the one-half of halfshade $=N_2$.
Order of other half of halfshade $=N'_2$.
Angle between major axis of incident light and principal azimuth of compensator $=\measuredangle(0,1)$.
Angle between compensator and halfshade $=\measuredangle(1,2)$.
Angle between halfshade and nicol $=\measuredangle(2,3)$.

[1] Skinner, C. A., and Tool, A. Q. *Phil. Mag.* (6), vol. 16, pp. 833–62, 1908.

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For a match, $Q_3 - Q'_3 = 0$, or from (53)

$$P_0 \frac{1-e_0^2}{1+e_0^2} \begin{vmatrix} -\cos 2(0,1)\sin 2(1,2)\sin 2(2,3) \ldots . & (\cos 2\pi N_2 - \cos 2\pi N'_2) \\ -\sin 2(0,1)\cos 2(1,2)\sin 2(2,3) & \cos 2\pi N_1 (\cos 2\pi N_2 - \cos 2\pi N'_2) \\ +\sin 2(0,1) \ldots . \sin 2(2,3) & \sin 2\pi N_1 (\sin 2\pi N_2 - \sin 2\pi N'_2) \end{vmatrix}$$

$$+ P_0 \frac{2e_0}{1+e_0^2} \begin{vmatrix} +\cos 2(1,2)\sin 2(2,3)\sin 2\pi N_1 (\cos 2\pi N_2 - \cos 2\pi N'_2) \\ + \ldots . \sin 2(2,3)\cos 2\pi N_1 (\sin 2\pi N_2 - \sin 2\pi N'_2) \end{vmatrix} = 0$$

Substituting $N_2 = N + \Delta N$, $N'_2 = N - \Delta N$, $\measuredangle(0,1) = \psi$, expanding, cancelling like terms and dividing by

$$P_0 \frac{1-e_0^2}{1+e_0^2} \sin 2(2,3)\cos 2\pi N \sin 2\pi \Delta N:$$

gives:

$$\begin{vmatrix} +\cos 2\psi \sin 2(1,2) \ldots . & \operatorname{tg} 2\pi N \\ +\sin 2\psi \cos 2(1,2)\cos 2\pi N_1 & \operatorname{tg} 2\pi N \\ +\sin 2\psi \ldots . \sin 2\pi N_1 & \end{vmatrix} \qquad (64)$$

$$+ \frac{2e_0}{1-e_0^2} \begin{vmatrix} -\cos 2(1,2)\sin 2\pi N_1 \operatorname{tg} 2\pi N \\ - \ldots . \cos 2\pi N_1 \end{vmatrix} = 0$$

The equation is independent of the angle (2,3), and consequently the match is independent of the azimuth of the analyzing nicol, although the sensibility depends upon it.

If the halfshade is balanced, $\operatorname{tg} 2\pi N = 0$, and

$$\frac{2e_0}{1-e_0^2} = -\sin 2\psi \operatorname{tg} 2\pi N_1 \qquad (65)$$

or

$$e_0 = -\tfrac{1}{2} \operatorname{tg} 2\pi N_1 \sin 2\psi \left(1 - \tfrac{1}{4} \operatorname{tg}^2 2\pi N_1 \sin^2 2\psi + \ldots .\right) \qquad (66)$$

If the halfshade is not balanced and *small ellipticities* are to be measured it is as before convenient to fix the halfshade, this time at 45° to the major axis of the incident light. Then:

$$\measuredangle(0,2) = \frac{\pi}{4} \qquad \measuredangle(1,2) = \frac{\pi}{4} - \psi$$

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By substituting in (64) there results after a slight reduction:

$$\frac{2e_o}{1-e_o^2}=\frac{\operatorname{tg}2\pi N+\sin 2\pi N_1 \sin 2\psi-2\sin^2\pi N_1 \operatorname{tg}2\pi N \sin^2 2\psi}{1-2\sin^2\pi N_1-\sin 2\pi N_1 \operatorname{tg}2\pi N \sin 2\psi} \qquad (67)$$

As before, if $\psi_o=\psi$ for $e_o=0$:

$$e_o=-\tfrac{1}{2}\sin 2\pi N_1(\sin 2\psi-\sin 2\psi_o)(1-e_o^2) \cdot\frac{1-\operatorname{tg}\pi N_1 \operatorname{tg}2\pi N(\sin 2\psi+\sin 2\psi_o)}{1-2\sin^2\pi N_1-\sin 2\pi N_1 \operatorname{tg}2\pi N \sin 2\psi} \qquad (68)$$

or, introducing approximations for e_o and $\sin 2\psi_o$:

$$e_o=-\operatorname{tg}\pi N_1(\sin 2\psi-\sin 2\psi_o)(1+\operatorname{tg}^2\pi N+\sin^2\pi N_1\cos^2 2\psi+\ldots)$$

to quantities of the second order in N and N_1. The correction factor may be neglected, provided $\operatorname{tg}^2\pi N+\sin^2\pi N_1$ is negligible in comparison with 1. Then

$$e_o=-\operatorname{tg}\pi N_1(\sin 2\psi-\sin 2\psi_o) \qquad (69)$$

In case *large ellipticities* are to be measured, the determination of the azimuth of the major axis of the ellipse becomes of importance, and the difficulty of determining it with the preceding arrangement renders the method valueless. For measuring large ellipticities, Mr. A. Q. Tool has devised an arrangement involving the measurement of the double rotation of compensator and analyzer, which is analogous to Stokes's method, and in fact may be considered as an application of the halfshade principle to Stokes's analyzer.

The analyzing nicol is replaced by a halfshade system of the Lippich type (split nicol, Lippich, or, for greater sensibility, a Brace sensitive strip), which will be designated simply as the "Lippich." The elliptic halfshade (which will be designated as before, simply "the halfshade"), instead of being fixed relative to the incident light, is fastened to the Lippich and rotates with it, i. e. in the previous notation, $\measuredangle(2,3)$ is constant. The divid-

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ing edges of the Lippich and the halfshade cross each other at an angle (preferably 90°), dividing the field into four parts. They should be placed as nearly in the same plane as possible, in order that both may be at the same time in focus in the observing telescope. A match of intensity of the two halves of the Lippich will be called a "Lippich match"; of the two halves of the halfshade, a "halfshade match." A complete match is both a Lippich and a halfshade match. The setting is always made for a complete match.

Expressed in terms of the light which emerges from the compensator ($\boldsymbol{P}_0$, $\boldsymbol{Q}_1$, $\boldsymbol{K}_1$, $\boldsymbol{S}_1$), the condition for a halfshade match is from (14):

$$\begin{aligned}
&-\boldsymbol{Q}_1 \sin 2(1,2) \sin 2(2,3) (\cos 2\pi N_2 - \cos 2\pi N'_2) \\
&+\boldsymbol{K}_1 \cos 2(1,2) \sin 2(2,3) (\cos 2\pi N_2 - \cos 2\pi N'_2) \\
&+\boldsymbol{S}_1 \ldots\ldots \sin 2(2,3) (\sin 2\pi N_2 - \sin 2\pi N'_2) = 0
\end{aligned}$$

Expanding in terms of N and ΔN and simplifying, this reduces to

$$[\boldsymbol{Q}_1 \sin 2(1,2) - \boldsymbol{K}_1 \cos 2(1,2)] \operatorname{tg} 2\pi N + \boldsymbol{S}_1 = 0$$

Similarly the condition for a Lippich match is from (14):

$$\begin{aligned}
&\kappa \boldsymbol{P}_0 + \boldsymbol{Q}_1 \left| \begin{array}{l} +\cos 2(1,2) \ldots\ldots [\cos 2(2,3) - (1-\kappa) \cos 2(2,3')] \\ -\sin 2(1,2) \cos 2\pi N_2 [\sin 2(2,3) - (1-\kappa) \sin 2(2,3')] \end{array} \right| \\
&+\boldsymbol{K}_1 \left| \begin{array}{l} +\sin 2(1,2) \ldots\ldots [\cos 2(2,3) - (1-\kappa) \cos 2(2,3')] \\ +\cos 2(1,2) \cos 2\pi N_2 [\sin 2(2,3) - (1-\kappa) \sin 2(2,3')] \end{array} \right| \\
&+\boldsymbol{S}_1 \sin 2\pi N_2 [\sin 2(2,3) - (1-\kappa) \sin 2(2,3')] = 0
\end{aligned}$$

Expanding in terms of N and ΔN and introducing the condition of a simultaneous halfshade match, the terms containing $\sin 2\pi \Delta N$ become zero, and it reduces to:

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$$\kappa \boldsymbol{P}_0+\boldsymbol{Q}_1\Big|\begin{array}{l}+\cos 2(1,2)\,[\cos 2(2,3)-(1-\kappa)\cos 2(2,3')]\\ -\sin 2(1,2)\cos 2\pi N\cos 2\pi\Delta N\,[\sin 2(2,3)\\ \qquad\qquad -(1-\kappa)\sin 2(2,3')]\end{array}\Big|$$

$$+\boldsymbol{K}_1\Big|\begin{array}{l}+\sin 2(1,2)\,[\cos 2(2,3)-(1-\kappa)\cos 2(2,3')]\\ +\cos 2(1,2)\cos 2\pi N\cos 2\pi\Delta N\,[\sin 2(2,3)\\ \qquad\qquad -(1-\kappa)\sin 2(2,3')]\end{array}\Big|$$

$$+\boldsymbol{S}_1\sin 2\pi N\cos 2\pi\Delta N\,[\sin 2(2,3)-(1-\kappa)\sin 2(2,3')]=0$$

Substituting for $\boldsymbol{Q}_1$, $\boldsymbol{K}_1$ and $\boldsymbol{S}_1$ their values, $\boldsymbol{Q}_1=\boldsymbol{P}_0\frac{1-e_1^2}{1+e_1^2}\cos 2\theta_1$, $\boldsymbol{K}_1=\boldsymbol{P}_0\frac{1-e_1^2}{1+e_1^2}\sin 2\theta_1$ and $\boldsymbol{S}_1=\boldsymbol{P}_0\frac{2e_1}{1+e_1^2}$, the equations become—for a halfshade match:

$$\frac{2e_1}{1-e_1^2}+\sin 2(1,2-\theta_1)\operatorname{tg} 2\pi N=0; \tag{70}$$

for a Lippich match:

$$\kappa+\frac{1-e_1^2}{1+e_1^2}\Big|\begin{array}{l}+\cos 2(1,2-\theta_1)\,[\cos 2(2,3)-(1-\kappa)\cos 2(2,3')]\\ -\sin 2(1,2-\theta_1)\cos 2\pi N\cos 2\pi\Delta N\,[\sin 2(2,3)\\ \qquad\qquad -(1-\kappa)\sin 2(2,3')]\end{array}\Big|$$

$$+\frac{2e_1}{1+e_1^2}\sin 2\pi N\cos 2\pi\Delta N\,[\sin 2(2,3)-(1-\kappa)\sin 2(2,3')]=0 \tag{71}$$

In these equations there occur only two variables, e_1 and $\measuredangle(1,2-\theta_1)$, the rest being constants depending on the rigid halfshade system. There is then a single pair of values of e_1 and $\measuredangle(1,2-\theta_1)$ for which a complete match exists. Letting this value of $e_1=\operatorname{tg}\eta$, and the corresponding value of $\measuredangle(1,2-\theta_1)=\alpha$, the analyzing system is characterized by η and α, which are constants of the system and satisfy the equations:

$$\operatorname{tg} 2\eta+\sin 2\alpha\operatorname{tg} 2\pi N=0$$

$$\kappa\sec 2\eta+\cos 2\alpha\,[\cos 2(2,3)-(1-\kappa)\cos 2(2,3')] \tag{72}$$
$$-\sin 2\alpha\frac{\cos 2\pi\Delta N}{\cos 2\pi N}\,[\sin 2(2,3)-(1-\kappa)\sin 2(2,3')]=0$$

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Introducing Stokes's notation: $\measuredangle(0,1)=-R$, $\measuredangle(90°-\theta_1)=-r$,

$$\therefore -r=90°+\alpha-\measuredangle(1,2),$$

i.e. any change in $\measuredangle(1,2)$ causes an equal change in r, so that r measures the rotation of the analyzing system.

If the initial light be referred as before to its major axis:

$$\frac{2e_1}{1-e^2_1}=\operatorname{tg}2\eta=\frac{\boldsymbol{S}_1}{\boldsymbol{Q}_1\cos 2\theta_1+\boldsymbol{K}_1\sin 2\theta_1}$$

$$=-\frac{\boldsymbol{S}_1}{\boldsymbol{Q}_1\cos 2r+\boldsymbol{K}_1\sin 2r}$$

or

$$\operatorname{tg}2\eta=-\frac{-\boldsymbol{Q}_o\sin 2R\sin 2\pi N_1+\boldsymbol{S}_o\cos 2\pi N_1}{\boldsymbol{Q}_o\cos 2R\cos 2r+\boldsymbol{Q}_o\sin 2R\sin 2r\cos 2\pi N_1+\boldsymbol{S}_o\sin 2r\sin 2\pi N_1}$$

which gives as the equation for the halfshade match:

$$\begin{aligned}&+\cos 2R\cos 2r\operatorname{tg}2\eta\\&+\sin 2R\sin 2r\operatorname{tg}2\eta\cos 2\pi N_1\\&-\sin 2R\sin 2\pi N_1\\&+\frac{2e_o}{1-e^2_o}\begin{vmatrix}+\sin 2r\operatorname{tg}2\eta\sin 2\pi N_1\\+\cos 2\pi N_1\end{vmatrix}=0\end{aligned}$$

For the Lippich match:

$$\operatorname{tg}2r=\operatorname{tg}2\theta_1=\frac{\boldsymbol{K}_1}{\boldsymbol{Q}_1}$$

$$=\frac{\boldsymbol{Q}_o\sin 2R\cos 2\pi N_1+\boldsymbol{S}_o\sin 2\pi N_1}{\boldsymbol{Q}_o\cos 2R};$$

or

$$\begin{aligned}&+\cos 2R\sin 2r\\&-\sin 2R\cos 2r\cos 2\pi N_1\\&-\frac{2e_o}{1-e^2_o}\cos 2r\sin 2\pi N_1=0\end{aligned}$$

If R and r are a solution of these equations, then $R'=\frac{\pi}{2}-R$, and $r'=\frac{\pi}{2}-r$ form another solution. Letting $c=R'-R=\frac{\pi}{2}-2R$, and $n=r'-r=\frac{\pi}{2}-2r$, the equations become:

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$$\begin{aligned}&+\sin c\sin n\,\mathrm{tg}\,2\eta\\&+\cos c\cos n\,\mathrm{tg}\,2\eta\cos 2\pi N_1\\&-\cos c\sin 2\pi N_1\\&+\frac{2e_o}{1-e_o^2}\left|\begin{matrix}+\cos n\sin 2\pi N_1\,\mathrm{tg}\,2\eta\\+\cos 2\pi N_1\end{matrix}\right|=0\end{aligned}\qquad(73)$$

and

$$\begin{aligned}&+\sin c\cos n\\&-\cos c\sin n\cos 2\pi N_1\\&-\frac{2e_o}{1-e_o^2}\sin n\sin 2\pi N_1=0\end{aligned}\qquad(74)$$

Care must be taken, as in Stokes's analyzer, to insure that R' and R are complementary to the azimuth of the major axis of the incident light, since otherwise the sign of e_o will be incorrect.

By starting with plane polarized light the constants of the analyzing system (η) and compensator (N_1) can be measured. Since the incident light is plane polarized, $e_o=0$ and (73) and (74) reduce to:

$$\begin{aligned}&+\sin c\sin n\,\mathrm{tg}\,2\eta\\&+\cos c\cos n\,\mathrm{tg}\,2\eta\cos 2\pi N_1\\&-\cos c\sin 2\pi N_1\qquad\qquad=0\end{aligned}$$

and

$$\sin c\cos n-\cos c\sin n\cos 2\pi N_1=0$$

from which

$$\cos 2\pi N_1=\frac{\mathrm{tg}\,c}{\mathrm{tg}\,n}\quad\text{or}\quad\mathrm{tg}\,\pi N_1=\sqrt{\frac{\sin(n-c)}{\sin(n+c)}}\qquad(75)$$

Also

$$\mathrm{tg}\,2\eta=\frac{\cos c\sin 2\pi N_1}{\sin c\sin n+\cos c\cos n\dfrac{\mathrm{tg}\,c}{\mathrm{tg}\,n}}$$

$$=\frac{\sin n\sin 2\pi N_1}{\mathrm{tg}\,c}$$

or

$$\mathrm{tg}\,2\eta=\frac{\sqrt{\sin(n+c)\sin(n-c)}}{\sin c}=\sqrt{\frac{\sin^2 n-\sin^2 c}{\sin^2 c}}\qquad(76)$$

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The signs of both $\operatorname{tg} 2\eta$ and $\sin 2\pi N_1$ are left undetermined by these equations, but both are known as soon as one is known.

Returning to equations (73) and (74) where $e_o \neq 0$, let $\frac{2e_o}{1-e_o^2}=t$, and arrange according to $\cos c$ and $\sin c$:

$$\begin{vmatrix} -\cos n & \cos 2\pi N_1 \\ +\cot 2\eta & \sin 2\pi N_1 \end{vmatrix} \cos c - \sin n \sin c - t \begin{vmatrix} +\cos n & \sin 2\pi N_1 \\ +\cot 2\eta & \cos 2\pi N_1 \end{vmatrix} = 0$$

and

$$-\sin n \cos 2\pi N_1 \cos c + \cos n \sin c - t \sin n \sin 2\pi N_1 = 0$$

Solving for t in the second of these equations:

$$t = \frac{-\sin n \cos 2\pi N_1 \cos c + \cos n \sin c}{\sin n \sin 2\pi N_1} \tag{77}$$

Substituting in the first:

$$\begin{vmatrix} -\cos n & \cos 2\pi N_1 \\ +\cot 2\eta & \sin 2\pi N_1 \end{vmatrix} \cos c - \sin n \sin c + \frac{\sin n \cos 2\pi N_1 \cos c - \cos n \sin c}{\sin n \sin 2\pi N_1} \begin{vmatrix} +\cos n & \sin 2\pi N_1 \\ +\cot 2\eta & \cos 2\pi N_1 \end{vmatrix} = 0$$

Clearing of fractions, expanding and collecting terms:

$$\begin{aligned} &-\cos c \sin n \\ &+\sin c \sin 2\pi N_1 \operatorname{tg} 2\eta \\ &+\sin c \cos n \cos 2\pi N_1 = 0 \end{aligned}$$

Substituting $\sin 2\pi N_1 = \frac{2 \operatorname{tg} \pi N_1}{1+\operatorname{tg}^2 \pi N_1}$, $\cos 2\pi N_1 = \frac{1-\operatorname{tg}^2 \pi N_1}{1+\operatorname{tg}^2 \pi N_1}$, clearing of fractions, and collecting terms:

$$\begin{aligned} &-\sin(c+n) \operatorname{tg}^2 \pi N_1 \\ &+2 \sin c \operatorname{tg} 2\eta \operatorname{tg} \pi N_1 \\ &+\sin(c-n) \qquad = 0 \end{aligned}$$

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Solving for $\operatorname{tg}\pi N_1$:

$$\operatorname{tg}\pi N_1=\frac{\sin c\operatorname{tg}2\eta\pm 1\sqrt{\sin^2 c\operatorname{tg}^2 2\eta+\sin(c+n)\sin(c-n)}}{\sin(c+n)}$$

Letting

$$a=\frac{\sin c}{1\sqrt{\sin(c+n)\sin(c-n)}}=\frac{\sin c}{1\sqrt{\sin^2 c-\sin^2 n}}$$

where the square root is given its positive value:

$$\operatorname{tg}\pi N_1=\sqrt{\frac{\sin(c-n)}{\sin(c+n)}}\left(a\operatorname{tg}2\eta-1\sqrt{1+a^2\operatorname{tg}^2 2\eta}\right) \tag{78}$$

The square root $1\sqrt{1+a^2\operatorname{tg}^2 2\eta}$ must also be given its positive value. If η is small and the ellipticity of the incident light is also not too small this may be expanded in a series:

$$\operatorname{tg}\pi N_1=\sqrt{\frac{\sin(c-n)}{\sin(c+n)}}\left(1-a\operatorname{tg}2\eta+\tfrac{1}{2}a^2\operatorname{tg}^2 2\eta-\tfrac{1}{8}a^4\operatorname{tg}^4 2\eta+\ldots\right) \tag{79}$$

If the ellipticity of the incident light is small the coefficient a becomes large, and for the value $t=\operatorname{tg}2\eta$ is infinite. For these values $\operatorname{tg}\pi N_1$ is given by the series:

$$\operatorname{tg}\pi N_1=\frac{\sin(c-n)}{2\sin c\operatorname{tg}2\eta}\left(1-\frac{1}{4a^2\operatorname{tg}^2 2\eta}+\frac{1}{8a^4\operatorname{tg}^4 2\eta}+\ldots\right) \tag{80}$$

In the equation (77), substitute,

$$\sin 2\pi N_1=\frac{2\operatorname{tg}\pi N_1}{1+\operatorname{tg}^2\pi N_1}$$

and

$$\cos 2\pi N_1=\frac{1-\operatorname{tg}^2\pi N_1}{1+\operatorname{tg}^2\pi N_1}$$

Then

$$t=\frac{-\cos c\sin n(1-\operatorname{tg}^2\pi N_1)\mp\sin c\cos n(1+\operatorname{tg}^2\pi N_1)}{2\sin n\operatorname{tg}\pi N_1}$$

$$=\frac{\sin(c-n)\mp\sin(c+n)\operatorname{tg}^2\pi N_1}{2\sin n\operatorname{tg}\pi N_1}$$

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Substituting

$$\sin(c+n)\,\mathrm{tg}^2\pi N_1 = 2\sin c\,\mathrm{tg}\,2\eta\,\mathrm{tg}\,\pi N_1 + \sin(c-n)$$

$$t = \frac{\sin(c-n)}{\sin n\,\mathrm{tg}\,\pi N_1} + \frac{\sin c}{\sin n}\,\mathrm{tg}\,2\eta$$

and again substituting the value of $\mathrm{tg}\,\pi N_1$ found above:

$$\begin{aligned} t &= \frac{\sin c}{\sin n}\left\{\mathrm{tg}\,2\eta + \frac{1}{a(a\,\mathrm{tg}\,2\eta - \sqrt{1+a^2\mathrm{tg}^2 2\eta})}\right\} \\ &= \frac{\sqrt{\sin(c-n)\sin(c+n)}}{\sin n}\left\{a\,\mathrm{tg}\,2\eta + \frac{1}{a\,\mathrm{tg}\,2\eta - \sqrt{1+a^2\mathrm{tg}^2 2\eta}}\right\} \end{aligned} \tag{81}$$

This in turn may be expanded in a series:

$$t = \frac{\sqrt{\sin(c-n)\sin(c+n)}}{\sin n}(1 + 2a\,\mathrm{tg}\,2\eta + \tfrac{1}{2}a^2\mathrm{tg}^2 2\eta - \tfrac{1}{8}a^4\mathrm{tg}^4 2\eta + \ldots) \tag{82}$$

and for small values of e_0:

$$t = \frac{\sin c}{\sin n}\,\mathrm{tg}\,2\eta\left\{1 + \frac{1}{2a^2\mathrm{tg}^2 2\eta} - \frac{1}{8a^4\mathrm{tg}^4 2\eta} + \ldots\right\} \tag{83}$$

In general the series in equations (79), (80), (82) and (83) are rapidly convergent and it is usually not necessary to consider terms beyond the first order in $\mathrm{tg}\,2\eta$. If the halfshade is balanced, $\mathrm{tg}\,2\eta = 0$, and the equations reduce to those for Stokes's analyzer.

If halfshade and compensator have both been calibrated, it is, as in Stokes's analyzer, not necessary to take both compensator and nicol readings, since either one alone is sufficient to determine t.

Arranging equations (73) and (74) according to $\sin n$ and $\cos n$

$$\begin{vmatrix} -\cos c\cos 2\pi N_1 \\ -t\sin 2\pi N_1 \end{vmatrix} \cos n - \sin c\sin n = \cot 2\eta \begin{vmatrix} -\cos c\sin 2\pi N_1 \\ +t\cos 2\pi N_1 \end{vmatrix}$$

and

$$\sin c\cos n + \begin{vmatrix} -\cos c\cos 2\pi N_1 \\ -t\sin 2\pi N_1 \end{vmatrix} \sin n = 0$$

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These are of the form:

$$\alpha\cos n-\beta\sin n=\gamma$$

$$\beta\cos n+\alpha\sin n=0$$

Squaring both and adding, $\alpha^2+\beta^2=\gamma^2$, which is an equation independent of n. Substituting values for α, β and γ, and arranging according to powers of t:

$$t^2(1-\sin^2 2\pi N_1\sec^2 2\eta)$$
$$-2t\cos c\sin 2\pi N_1\cos 2\pi N_1\sec^2 2\eta$$
$$+[1-(1-\cos^2 c\sin^2 2\pi N_1)\sec^2 2\eta]=0$$

Solving for t:

$$t=\frac{\cos c\sin 2\pi N_1\cos 2\pi N_1\sec^2 2\eta\pm\operatorname{tg} 2\eta\sqrt{1-\sin^2 2\pi N_1\sec^2 2\eta\sin^2 c}}{1-\sin^2 2\pi N_1\sec^2 2\eta} \tag{84}$$

which is of the form: $t=k_1\cos c+k_2\sqrt{1-k_3\sin^2 c}$
where k_1, k_2 and k_3 are constants depending only on N_1 and η. If η is small the equation approaches the equation for Stokes's analyzer,

$$t=\operatorname{tg} 2\pi N_1\cos c$$

As $2\pi N_1$ approaches $\frac{\pi}{2}$, this approaches the form, $t=\infty\cdot 0$, so that the equation becomes illusory for compensators which are approximately quarter-wave plates and are required for measuring large ellipticities. The value of t varies less with changes of c, the more nearly $t=\operatorname{tg} 2\pi N_1$ which gives the condition for greatest accuracy in determining t.

When $2\pi N_1$ is near $\frac{\pi}{2}$, a usable equation may be obtained by eliminating c instead of n. Arranged according to $\cos c$ and $\sin c$, the equations (73) and (74) are of the form:

$$\alpha\cos c+\beta\sin c+\gamma=0$$

$$\delta\cos c+\epsilon\sin c+\zeta=0$$

Solving for $\cos c$ and $\sin c$, squaring, adding and clearing of fractions:

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$$\begin{vmatrix} \gamma & \beta \\ \zeta & \epsilon \end{vmatrix}^2 + \begin{vmatrix} \alpha & \gamma \\ \delta & \zeta \end{vmatrix}^2 - \begin{vmatrix} \alpha & \beta \\ \delta & \epsilon \end{vmatrix}^2 = 0$$

an equation which is independent of c. Substituting values, simplifying and collecting terms:

$$[1-(\cos 2\eta \sin 2\pi N_1 \cos n - \sin 2\eta \cos 2\pi N_1)^2]\, t^2$$
$$-(\cos 2\eta \sin 2\pi N_1 \cos n - \sin 2\eta \cos 2\pi N_1)^2 = 0$$

which gives:

$$t = \frac{a - b\cos n}{\sqrt{1-(a-b\cos n)^2}} \tag{85}$$

where $a = \sin 2\eta \cos 2\pi N_1$, and $b = \cos 2\eta \sin 2\pi N_1$. Letting $a - b\cos n = \sin \chi$, then:

$$t = \operatorname{tg} \chi \quad \text{and} \quad e_0 = \operatorname{tg} \tfrac{1}{2}\chi \tag{86}$$

These equations are still usable when $2\pi N_1 = \frac{\pi}{2}$.

This method evidently has all the experimental advantages of Stokes's analyzer, with the added sensibility of a halfshade system. It has the disadvantage of slightly more complicated formulae for unbalanced halfshades, but for balanced halfshades, as has been shown, the formulae are the same.

10. Sensibility of Halfshade Systems

Let the intensity of the light emerging from one side of the halfshade system be I, and from the other I'. Let one-half the difference in intensity between the two halves, $\frac{1}{2}(I-I') = \Delta I$, and the average intensity of the two halves, $\frac{1}{2}(I+I') = I_m$. Then the condition for an observed match is:

$$\frac{\Delta I}{I_m} \gtrless \tfrac{1}{2} f(I_m, \alpha, \beta, \gamma, \ldots) \tag{87}$$

where $f(I_m, \alpha, \beta, \gamma, \ldots)$ is the photometric function. $\alpha, \beta, \gamma, \ldots$ are constants depending on the sharpness of the dividing line between the two halves of the field, the parallelism and purity of the

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(assumed monochromatic) light and other incidental factors. If a perfect match were obtained ΔI would equal zero.

If the light incident on the system is elliptically polarized, ΔI and I_m will in general be functions of its initial ellipticity e_0 and its initial azimuth θ_0.

Starting with a perfect match,

$$\frac{\Delta I}{I_m}=0,$$

and varying e_0 within the limits of an observed match, equation (87) becomes:

$$\frac{\partial}{\partial e_0}\left[\frac{\Delta I}{I_m}\right]\delta e_0 \gtrless \tfrac{1}{2} f(I_m,\alpha,\beta,\gamma,\ldots) \tag{88}$$

Again, varying the azimuth θ_0 within the limits of an observed match:

$$\frac{\partial}{\partial \theta_0}\left[\frac{\Delta I}{I_m}\right]\delta \theta_0 \gtrless \tfrac{1}{2} f(I_m,\alpha,\beta,\gamma,\ldots) \tag{89}$$

The maximum possible variations or errors of e_0 and θ_0 compatible with an observed match are then:

$$\delta e_0=\tfrac{1}{2}\frac{f(I_m,\alpha,\beta,\gamma,\ldots)}{\frac{\partial}{\partial e_0}\left[\frac{\Delta I}{I_m}\right]} \tag{90}$$

and:

$$\delta \theta_0=\tfrac{1}{2}\frac{f(I_m,\alpha,\beta,\gamma,\ldots)}{\frac{\partial}{\partial \theta_0}\left[\frac{\Delta I}{I_m}\right]} \tag{91}$$

Although the form of $f(I_m,\alpha,\beta,\gamma,\ldots)$ is not definitely known, certain general conclusions about the variation of sensibility with varying experimental conditions may be deduced for special halfshade systems.

Type A.

Lippich Half Nicol.

Brace Sensitive Strip, etc.

Here $I=I_1$ and $I'=(1-\kappa)I'_1$. Then from (11)

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$$\frac{\Delta I}{I_m}=\frac{\kappa P_1+Q_1-(1-\kappa)Q'_1}{(2-\kappa)P_1+Q_1+(1-\kappa)Q'_1}$$

$$=\frac{\begin{vmatrix}\kappa P_o\\ +Q_o[\cos 2(o,1)-(1-\kappa)\cos 2(o,1')]\\ +K_o[\sin 2(o,1)-(1-\kappa)\sin 2(o,1')]\end{vmatrix}}{\begin{vmatrix}(2-\kappa)P_o\\ +Q_o[\cos 2(o,1)+(1-\kappa)\cos 2(o,1')]\\ +K_o[\sin 2(o,1)+(1-\kappa)\sin 2(o,1')]\end{vmatrix}}$$

If the initial light is plane polarized:

$$Q_o=P_o\cos 2\theta_o$$

$$K_o=P_o\sin 2\theta_o$$

Substituting these values and simplifying:

$$\frac{\Delta I}{I_m}=\frac{\kappa+\cos 2(o,1-\theta_o)-(1-\kappa)\cos 2(o,1'-\theta_o)}{(2-\kappa)+\cos 2(o,1-\theta_o)+(1-\kappa)\cos 2(o,1'-\theta_o)}$$

Differentiating with respect to θ_o and introducing the condition for a perfect match:

$$\kappa+\cos 2(o,1-\theta_o)-(1-\kappa)\cos 2(o,1'-\theta_o)=0$$

$$\frac{\partial}{\partial\theta_o}\left[\frac{\Delta I}{I_m}\right]=\frac{\sin 2(o,1-\theta_o)-(1-\kappa)\sin 2(o,1'-\theta_o)}{1+\cos 2(o,1-\theta_o)}$$

and,

$$\delta\theta_o=\tfrac{1}{2}\frac{1+\cos 2(o,1-\theta_o)}{\sin 2(o,1-\theta_o)-(1-\kappa)\sin 2(o,1'-\theta_o)}f(I_m,\alpha,\beta,\gamma,\ldots)\quad(92)$$

But

$$1+\cos 2(o,1-\theta_o)=\frac{I_m}{P_o}$$

From which:

$$\sin 2(o,1-\theta_o)=\frac{1}{P_o}\sqrt{I_m(2P_o-I_m)}$$

and,

$$(1-\kappa)\sin 2(o,1'-\theta_o)=\frac{1}{P_o}\sqrt{I_m[2P_o(1-\kappa)-I_m]}$$

Then

$$\delta\theta_o=\tfrac{1}{2}\frac{I_m}{\sqrt{I_m(2P_o-I_m)}+\sqrt{I_m[2P_o(1-\kappa)-I_m]}}f(I_m,\alpha,\beta,\gamma,\ldots)\quad(93)$$

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or approximately since κ is small and I_m small compared with $2P_0$

$$\delta\theta_0=\frac{1}{4}\sqrt{\frac{I_m}{2P_0}}f(I_m,\alpha,\beta,\gamma,\ \ldots\ ) \qquad (94)$$

Type B

Bravais Biplate.

Brace Elliptic Halfshade.

Laurent Saccharimeter Halfshade.

For these $I=I_2$ and $I'=I'_2$, the difference between the two halves consisting of the difference between the orders N_1 and N'_1 of the two halves of the halfshade. Then from (14)

$$\frac{\Delta I}{I_m}=\frac{\begin{vmatrix} -Q_0\sin 2(0,1)\sin 2(1,2)(\cos 2\pi N_1-\cos 2\pi N'_1) \\ +K_0\cos 2(0,1)\sin 2(1,2)(\cos 2\pi N_1-\cos 2\pi N'_1) \\ +S_0\ \ldots\ldots\ \sin 2(1,2)(\sin 2\pi N_1-\sin 2\pi N'_1) \end{vmatrix}}{\begin{vmatrix} +2P_0 & & \\ +2Q_0\cos 2(0,1)\cos 2(1,2) & & \\ +2K_0\sin 2(0,1)\cos 2(1,2) & & \\ -Q_0\sin 2(0,1)\sin 2(1,2)(\cos 2\pi N_1+\cos 2\pi N'_1) & & \\ +K_0\cos 2(0,1)\sin 2(1,2)(\cos 2\pi N_1+\cos 2\pi N'_1) & & \\ +S_0\ \ldots\ldots\ \sin 2(1,2)(\sin 2\pi N_1+\sin 2\pi N'_1) & & \end{vmatrix}}$$

Substituting $\frac{1}{2}(N_1+N'_1)=N$, and $\frac{1}{2}(N_1-N'_1)=\Delta N$:

$$\frac{\Delta I}{I_m}=\frac{\begin{vmatrix} +\begin{vmatrix} +Q_0\sin 2(0,1) \\ -K_0\cos 2(0,1) \end{vmatrix}\sin 2\pi N \\ +S_0\cos 2\pi N \end{vmatrix}\sin 2(1,2)\sin 2\pi\Delta N}{\begin{vmatrix} +P_0 & & \\ +Q_0\cos 2(0,1)\cos 2(1,2) & & \\ +K_0\sin 2(0,1)\cos 2(1,2) & & \\ +\begin{vmatrix} -\begin{vmatrix} +Q_0\sin 2(0,1) \\ -K_0\cos 2(0,1) \end{vmatrix}\cos 2\pi N \\ +S_0\sin 2\pi N \end{vmatrix}\sin 2(1,2)\cos 2\pi\Delta N & & \end{vmatrix}}$$

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Substituting

$$\begin{aligned} P_o &= P_o \\ Q_o &= P_o \frac{1-e_o^2}{1+e_o^2} \cos 2\theta_o \\ K_o &= P_o \frac{1-e_o^2}{1+e_o^2} \sin 2\theta_o \\ S_o &= P_o \frac{2e_o}{1+e_o^2} \end{aligned} \tag{17}$$

There results:

$$\frac{\Delta I}{I_m} = \frac{\left| \frac{1-e_o^2}{1+e_o^2} \sin 2(o, 1-\theta_o) \sin 2\pi N + \frac{2e_o}{1+e_o^2} \cos 2\pi N \right| \sin 2(1,2) \sin 2\pi \Delta N}{\left| 1 + \frac{1-e_o^2}{1+e_o^2} \cos 2(o, 1-\theta_o) \cos 2(1,2) - \left| \frac{1-e_o^2}{1+e_o^2} \sin 2(o, 1-\theta_o) \cos 2\pi N - \frac{2e_o}{1+e_o^2} \sin 2\pi N \right| \sin 2(1,2) \cos 2\pi \Delta N \right|} \tag{95}$$

Bravais Biplate and Brace Elliptic Halfshade.—In discussing sensibility to changes of ellipticity of the incident light, no needful generality is lost by considering the halfshade to be a balanced halfshade ($N=O$) since the unbalanced portion of the halfshade may, if large enough to be of importance, be considered as a part of the compensating system. Introducing this condition, $N=o$.

$$\frac{\Delta I}{I_m} = \frac{\frac{2e_o}{1+e_o^2} \sin 2(1,2) \sin 2\pi \Delta N}{\left| 1 + \frac{1-e_o^2}{1+e_o^2} \cos 2(o, 2-\theta_o) + \frac{1-e_o^2}{1+e_o^2} \sin 2(o, 1-\theta_o) \sin 2(1,2) (1-\cos 2\pi \Delta N) \right|}$$

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Differentiating with respect to e_o, and introducing the condition for a perfect match, $e_o=0$:

$$\frac{\partial}{\partial e_o}\left[\frac{\Delta I}{I_m}\right]=\frac{2\sin 2(1,2)\sin 2\pi\Delta N}{1+\cos 2(0,2-\theta_o)+2\sin 2(0,1-\theta_o)\sin 2(1,2)\sin^2\pi\Delta N}$$

Then the maximum possible error in e_o, compatible with an observed match, is:

$$\delta e_o=\tfrac{1}{4}f(I_m,\alpha,\beta,\gamma,\ldots)\frac{\left|\begin{array}{l}1+\cos 2(0,2-\theta_o)\\ +2\sin 2(0,2-1,2-\theta_o)\sin 2(1,2)\sin^2\pi\Delta N\end{array}\right|}{\sin 2(1,2)\sin 2\pi\Delta N}$$

$$=\tfrac{1}{4}f(I_m,\alpha,\beta,\gamma,\ldots)\frac{\left|\begin{array}{l}1+[1-2\sin^2 2(1,2)\sin^2\pi\Delta N]\cos 2(0,2-\theta_o)\\ +\sin 4(1,2)\sin^2\pi\Delta N\sin 2(0,2-\theta_o)\end{array}\right|}{\sin 2(1,2)\sin 2\pi\Delta N} \qquad (96)$$

The numerator of this expression is $\frac{I_m}{P_o}$. Although the form of $f(I_m,\alpha,\beta,\gamma,\ldots\ldots)$ is not definitely known, it is known that for all useful values of I_m, the expression $I_m f(I_m,\alpha,\beta,\gamma,\ldots.)$ decreases with decreasing I_m. If, therefore, the numerator of the expression for δe_o, be decreased without altering the denominator, δe_o is decreased and the sensibility increased. This can be done by varying $\measuredangle(0,2-\theta_o)$. Differentiating the numerator with respect to $\measuredangle(0,2-\theta_o)$ and equating to zero.

$$-[1-2\sin^2 2(1,2)\sin^2\pi\Delta N]\sin 2(0,2-\theta_o)$$
$$+\sin 4(1,2)\sin^2\pi\Delta N\cos 2(0,2-\theta_o)=0$$

Solving for $\operatorname{tg} 2(0,2-\theta_o)$:

$$\operatorname{tg} 2(0,2-\theta_o)=\frac{\sin 4(1,2)\sin^2\pi\Delta N}{1-2\sin^2 2(1,2)\sin^2\pi\Delta N}$$

from which (97)

$$\sin 2(0,2-\theta_o)=-\frac{\sin 4(1,2)\sin^2\pi\Delta N}{1-\sin^2 2(1,2)\sin^2 2\pi\Delta N}$$

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and

$$\cos 2(o,2-\theta_o)=-\frac{1-2\sin^2 2(1,2)\sin^2\pi\Delta N}{\sqrt{1-\sin^2 2(1,2)\sin^2 2\pi\Delta N}} \qquad (97)$$

These give a minimum of I_m for any constant value of $\sin 2(1,2)\sin 2\pi\Delta N$. The negative sign is used since the positive sign gives a maximum of I_m. Substituting these values in δe_o and reducing:

$$\delta e_o=\tfrac{1}{4}\frac{1-\sqrt{1-\sin^2 2(1,2)\sin^2 2\pi\Delta N}}{\sin 2(1,2)\sin 2\pi\Delta N}\, f(I_m,\alpha,\beta,\gamma,\ldots) \qquad (98)$$

This value of δe_o can be written as a function of $I_m,\alpha,\beta,\gamma,\ldots$ alone and independent of $\measuredangle(1,2)$ and the differential order of the halfshade, ΔN, for:

$$I_m=\boldsymbol{P}_o(1-\sqrt{1-\sin^2 2(1,2)\sin^2 2\pi\Delta N})$$

from which

$$\sin 2(1,2)\sin 2\pi\Delta N=\frac{1}{\boldsymbol{P}_o}\sqrt{I_m(2\boldsymbol{P}_o-I_m)}$$

or

$$\delta e_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2\boldsymbol{P}_o-I_m}}\, f(I_m,\alpha,\beta,\gamma,\ldots) \qquad (99)$$

Or approximately, since I_m is small in comparison with $2\boldsymbol{P}_o$:

$$\delta e_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2\boldsymbol{P}_o}}\, f(I_m,\alpha,\beta,\gamma,\ldots) \qquad (100)$$

Therefore, the maximum attainable sensibility of a balanced elliptic halfshade of the type discussed is independent of the difference in order of its two halves (ΔN), provided that the difference is great enough to secure the requisite intensity.[1]

Although the condition above discussed gives theoretically the greatest sensibility, it is more usual and in practice easier to make

[1] The conclusion drawn by Zakrzewski (Zakrzewski, M. C., *Bull. Int. de l'Acad. des Sci. de Crac.*, pp. 1016–26, Nov., 1907) that a quarter-wave Bravais biplate ($\Delta N=\frac{1}{4}$) gives a maximum sensibility is apparently due to an invalid approximation.

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$(0,2-\theta_0)=90°$, i.e. to set the analyzing nicol at right angles to the plane of polarization of the original light. This gives:

$$\delta e_0=\tfrac{1}{2}\frac{\sin 2(1,2)\sin^2\pi\Delta N}{\sin 2\pi\Delta N}f(I_m,\alpha,\beta,\gamma,\ldots) \qquad (101)$$

Since $\sin^2 2(1,2)\sin^2 2\pi\Delta N$ is always small in practice, the equation for maximum sensibility (98), neglecting higher powers, may be written:

$$\delta e_0=\tfrac{1}{2}\frac{\sin 2(1,2)\,(\sin^2\pi\Delta N-\sin^4\pi\Delta N)}{\sin 2\pi\Delta N}f(I_m,\alpha,\beta,\gamma,\ldots)$$

For low values of ΔN, $\sin^4\pi\Delta N$ may be neglected in comparison with $\sin^2\pi\Delta N$, and the sensibility in both cases is practically the same.

For large values of ΔN, however, as in the Bravais biplate, where $\Delta N=\tfrac{1}{4}$, the ratio of the two sensibilities may be as great as two to one.

Of the other factors, $\alpha,\beta,\gamma,\ldots$ on which the sensibility depends, the sharpness of the dividing line, which is inherent in the halfshade, is of the greatest importance[1]; and in this respect the Brace halfshade is far superior to the Bravais biplate. In joining the two halves of the Bravais biplate, it is difficult, if not impossible, to avoid considerable diffuse reflection with its consequent depolarizing action. In the Brace halfshade the thin edge of the mica is mounted in balsam of nearly the same index of refraction, so that this effect is reduced to a minimum, and the dividing edge is clear and sharp.

Laurent Saccharimeter Halfshade.—The sensibility to azimuth variations is of special interest when the incident light is plane polarized. Then $e_0=0$ and from (95)

$$\frac{\Delta I}{I_m}=\frac{\sin 2(0,1-\theta_0)\sin 2(1,2)\sin 2\pi N\sin 2\pi\Delta N}{\begin{vmatrix}1+\cos 2(0,1-\theta_0)\cos 2(1,2)\\ -\sin 2(0,1-\theta_0)\sin 2(1,2)\cos 2\pi N\cos 2\pi\Delta N\end{vmatrix}}$$

[1] Lummer, O., and Brodhun, E. *Ztschr. f. Instk.*, vol. 9, pp. 41–50, 1889.

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Differentiating with respect to θ_o and introducing the condition for a perfect match, $\measuredangle(0,1-\theta_o)=0$, gives:

$$\frac{\partial}{\partial\theta_o}\left[\frac{\Delta I}{I_m}\right]=-\frac{2\sin 2(1,2)\sin 2\pi N\sin 2\pi\Delta N}{1+\cos 2(1,2)}$$

or

$$\delta\theta_o=-\tfrac{1}{4}\frac{1+\cos 2(1,2)}{\sin 2(1,2)\sin 2\pi N\sin 2\pi\Delta N}f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (102)$$

This will be a minimum for constant I_m when $\sin 2\pi N\sin 2\pi\Delta N$ is a maximum, i.e. $N=\tfrac{1}{4}$ and $\Delta N=\tfrac{1}{4}$. This is the condition in the Laurent saccharimeter halfshade. Then:

$$\delta\theta_o=-\tfrac{1}{4}\frac{1+\cos 2(1,2)}{\sin 2(1,2)}f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (103)$$

Substituting

$$\frac{I_m}{P_o}=1+\cos 2(1,2)$$

$$\delta\theta_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2P_o-I_m}}\,f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (104)$$

or approximately

$$\delta\theta_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2P_o}}\,f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (105)$$

A comparison of the formulae for the maximum sensibility of these three halfshades—balanced elliptic halfshade, Laurent saccharimeter halfshade, and Lippich halfnicol—is of interest:

Lippich: $$\delta\theta_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2P_o}}f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (94)$$

Laurent: $$\delta\theta_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2P_o}}f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (105)$$

Elliptic: $$\delta e_o=\tfrac{1}{4}\sqrt{\frac{I_m}{2P_o}}f(I_m,\alpha,\beta,\gamma,\ldots\ldots) \quad (100)$$

Whatever difference, then, exists between these sensibilities in practice arises from the constants, α, β, γ, ... , depending on the sharpness of the dividing line, the parallelism and homogeneity of the light, and other incidental factors. Since these factors have great influence on the value of $f(I_m,\alpha,\beta,\gamma,\ldots)$

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the formal equality of the sensibilities shown above can not be expected to be realized in practice. A careful comparison of the Lippich halfnicol with the Laurent saccharimeter halfshade, involving a partial discussion of the value of $f(I_m, \alpha, \beta, \gamma, \ldots)$ has been made by F. Lippich.[1] The relative sensibilities of various systems actually realized in practice have been discussed by Brace.[2]

11. Errors in the Use of a Compensator

Since elliptically polarized light is always measured by the use of a compensator, an estimate of the accuracy of its determination can only be made by a discussion of the errors involved in the use of a compensator. If light of ellipticity e_0 and azimuth θ_0 is changed by a compensator of order N_1 and azimuth ψ into light of ellipticity e_1 and azimuth θ_1, the coefficients determining the errors in the determination of e_0 and θ_0 are the partial differential coefficients: $\frac{\partial e_0}{\partial e_1}, \frac{\partial e_0}{\partial \theta_1}, \frac{\partial e_0}{\partial \psi}, \frac{\partial e_0}{\partial N_1}$, and $\frac{\partial \theta_0}{\partial e_1}, \frac{\partial \theta_0}{\partial \theta_1}, \frac{\partial \theta_0}{\partial \psi}, \frac{\partial \theta_0}{\partial N_1}$. By means of these the accuracy of the determination of e_0 and θ_0 may be found if the errors δe_1, $\delta \theta_1$, $\delta \psi$, and δN_1 are known.

If all azimuths are referred to the same axes of reference, the second form of the general theorem is the more convenient. Then in equations (13) letting $\measuredangle(0,1)=\psi$:

$$
\begin{aligned}
\boldsymbol{P}_0 &= +\boldsymbol{P}_1 \\
\boldsymbol{Q}_0 &= +\boldsymbol{Q}_1(1-2\sin^2 2\psi \sin^2 \pi N_1) \\
&\quad +\boldsymbol{K}_1 \sin 4\psi \sin^2 \pi N_1 \\
&\quad +\boldsymbol{S}_1 \sin 2\psi \sin 2\pi N_1 \\
\boldsymbol{K}_0 &= +\boldsymbol{Q}_1 \sin 4\psi \sin^2 \pi N_1 \\
&\quad +\boldsymbol{K}_1(1-2\cos^2 2\psi \sin^2 \pi N_1) \\
&\quad -\boldsymbol{S}_1 \cos 2\psi \sin 2\pi N_1 \\
\boldsymbol{S}_0 &= -\boldsymbol{Q}_1 \sin 2\psi \sin 2\pi N_1 \\
&\quad +\boldsymbol{K}_1 \cos 2\psi \sin 2\pi N_1 \\
&\quad +\boldsymbol{S}_1 \ldots \cos 2\pi N_1
\end{aligned}
$$

[1] Lippich, F. *Wien. Ber.*, vol. 99, p. 695, 1890; *Ztschr. f. Instk.*, vol. 12, pp. 333–42, 1892.

[2] Brace, D. B. *Phys. Rev.*, vol. 18, pp. 70–88, 1904.

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then (22):

$$\operatorname{tg} 2\theta_o = \frac{K_o}{Q_o}$$

From which

$$\operatorname{tg} 2(\psi - \theta_o) = \frac{Q_o \sin 2\psi - K_o \cos 2\psi}{Q_o \cos 2\psi + K_o \sin 2\psi}$$

Also (24):

$$\frac{2e_o}{1+e_o^2} = \frac{S_o}{P_o}$$

Substituting the values of Q_o, K_o and S_o, in terms of Q_1, K_1 and S_1, replacing these in turn by $Q_1 = P_o \frac{1-e_1^2}{1+e_1^2} \cos 2\theta_1$, $K_1 = P_o \frac{1-e_1^2}{1+e_1^2} \sin 2\theta_1$ and $S_1 = P_o \frac{2e_1}{1+e_1^2}$, and expressing e_1 and e_o in terms of ω_1 and ω_o, defined by the equations, $\operatorname{tg} \omega_1 = e_1$ and $\operatorname{tg} \omega_o = e_o$, there results:

$$\operatorname{tg} 2(\psi - \theta_o) = \operatorname{tg} 2(\psi - \theta_1) \cos 2\pi N_1 + \sec 2(\psi - \theta_1) \operatorname{tg} 2\omega_1 \sin 2\pi N_1 \quad (106)$$

and

$$\sin 2\omega_o = \sin 2\omega_1 \cos 2\pi N_1 - \sin 2(\psi - \theta_1) \cos 2\omega_1 \sin 2\pi N_1 \quad (107)$$

It is convenient in the differential coefficients, to replace functions of the angles $(\psi - \theta_o)$ and $(\psi - \theta_1)$ by their values in terms of ω_o, ω_1, and N_1. These are given by the following equations. Defining for convenience the symmetrical function of ω_o and ω_1, $\delta(\omega_o, \omega_1)$ by

$$\delta(\omega_o, \omega_1) = \sqrt{\cos^2 2\omega_o \cos^2 2\omega_1 - (\cos 2\pi N_1 - \sin 2\omega_o \sin 2\omega_1)^2} \quad (108)$$

Then:

$$\begin{aligned}
\sin 2(\psi - \theta_o) &= \frac{\sin 2\omega_1 - \sin 2\omega_o \cos 2\pi N_1}{\cos 2\omega_o \sin 2\pi N_1} \\
\cos 2(\psi - \theta_o) &= \frac{\delta(\omega_o, \omega_1)}{\cos 2\omega_o \sin 2\pi N_1} \\
\operatorname{tg} 2(\psi - \theta_o) &= \frac{\sin 2\omega_1 - \sin 2\omega_o \cos 2\pi N_1}{\delta(\omega_o, \omega_1)} \\
\sin 2(\psi - \theta_1) &= \frac{\sin 2\omega_1 \cos 2\pi N_1 - \sin 2\omega_o}{\cos 2\omega_1 \sin 2\pi N_1} \\
\cos 2(\psi - \theta_1) &= \frac{\delta(\omega_o, \omega_1)}{\cos 2\omega_1 \sin 2\pi N_1} \\
\operatorname{tg} 2(\psi - \theta_1) &= \frac{\sin 2\omega_1 \cos 2\pi N_1 - \sin 2\omega_o}{\delta(\omega_o, \omega_1)}
\end{aligned} \quad (109)$$

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Here it is to be noted that if $\cos 2(\psi-\theta_o)=0$, then $s(\omega_o,\omega_1)=0$ and $\cos 2(\psi-\theta_1)=0$.

Differentiating the expressions for $\operatorname{tg} 2(\psi-\theta_o)$ and $\sin 2\omega_o$, substituting values for the functions of $(\psi-\theta_o)$ and $(\psi-\theta_1)$ which appear in the coefficients and finally using the relations:

$$\frac{\partial e_o}{\partial -}=\frac{de_o}{d\omega_o}\frac{\partial \omega_o}{\partial -}=\sec^2\omega_o\frac{\partial \omega_o}{\partial -}$$

$$\frac{\partial -}{\partial e_1}=\frac{d\omega_1}{de_1}\frac{\partial -}{\partial \omega_1}=\cos^2\omega_1\frac{\partial -}{\partial \omega_1}$$

the following results are obtained:

$$\frac{\partial e_o}{\partial e_1}=\sec^2\omega_o\sec 2\omega_o\cos^2\omega_1\sec 2\omega_1\cos 2\pi N_1$$
$$-\sec^2\omega_o\operatorname{tg} 2\omega_o\cos^2\omega_1\operatorname{tg} 2\omega_1$$

$$-\frac{\partial e_o}{\partial \theta_1}=\frac{\partial e_o}{\partial \psi}=-s(\omega_o,\omega_1)\sec^2\omega_o\sec 2\omega_o \qquad (110)$$

$$\frac{\partial e_o}{\partial \pi N_1}=\sec^2\omega_o\operatorname{tg} 2\omega_o\cot 2\pi N_1-\sec^2\omega_o\sec 2\omega_o\sin 2\omega_1\csc 2\pi N_1$$

and

$$-\frac{\partial \theta_o}{\partial e_1}=s(\omega_o,\omega_1)\sec^2 2\omega_o\cos^2\omega_1\sec 2\omega_1$$

$$\frac{\partial \theta_o}{\partial \theta_1}=1-\frac{\partial \theta_o}{\partial \psi}=\sec^2 2\omega_o(\cos 2\pi N_1-\sin 2\omega_o\sin 2\omega_1) \qquad (111)$$

$$-\frac{\partial \theta_o}{\partial \pi N_1}=s(\omega_o,\omega_1)\operatorname{tg} 2\omega_o\sec 2\omega_o\csc 2\pi N_1$$

There are two important special cases:

1. The compensator is placed at 45° to the incident light, and the compensated light is plane polarized: $\cos 2(\psi-\theta_o)=0$ and $\omega_1=0$.

2. The compensated light is plane polarized, and the compensator is a quarter-wave plate: $\omega_1=0$ and $N_1=\frac{1}{4}$.

In the first case $\cos 2(\psi-\theta_o)=0$ and therefore $s(\omega_o,\omega_1)=0$.

Then:

$$-\frac{\partial e_o}{\partial \theta_1}=\frac{\partial e_o}{\partial \psi}=-\frac{\partial \theta_o}{\partial e_1}=-\frac{\partial \theta_o}{\partial N_1}=0 \qquad (112)$$

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That is: the errors in e_o due to errors in the determination of θ_1 and ψ, and the errors in θ_o due to errors in the determination of e_1 and N_1 are at the most of the second order and hence negligible.

If in addition $\omega_1 = 0$:

$$\frac{\partial e_o}{\partial e_1} = \frac{\partial e_o}{\partial \pi N_1} = \sec^2 \omega_o$$

and

$$\frac{\partial \theta_o}{\partial \theta_1} = 1 - \frac{\partial \theta_o}{\partial \psi} = \sec 2\omega_o \tag{113}$$

In the second case, $\omega_1 = 0$ and therefore,

$$s(\omega_o, \omega_1) = \sqrt{\cos^2 2\omega_o - \cos^2 2\pi N_1}$$

where

$$|\sin 2\omega_o| \not> |\sin 2\pi N_1|$$

Then:

$$\frac{\partial e_o}{\partial e_1} = \sec^2 \omega_o \sec 2\omega_o \cos 2\pi N_1$$

$$-\frac{\partial e_o}{\partial \theta_1} = \frac{\partial e_o}{\partial \psi} = -\sqrt{\cos^2 2\omega_o - \cos^2 2\pi N_1} \cdot \sec^2 \omega_o \sec 2\omega_o \tag{114}$$

$$\frac{\partial e_o}{\partial \pi N_1} = \sec^2 \omega_o \operatorname{tg} 2\omega_o \cot 2\pi N_1$$

and

$$-\frac{\partial \theta_o}{\partial e_1} = \sqrt{\cos^2 2\omega_o - \cos^2 2\pi N_1} \cdot \sec^2 2\omega_o$$

$$\frac{\partial \theta_o}{\partial \theta_1} = 1 - \frac{\partial \theta_o}{\partial \psi} = \sec^2 2\omega_o \cos 2\pi N_1 \tag{115}$$

$$\frac{\partial \theta_o}{\partial \pi N_1} = \sqrt{\cos^2 2\omega_o - \cos^2 2\pi N_1} \cdot \operatorname{tg} 2\omega_o \sec 2\omega_o \csc 2\pi N_1$$

If in addition, $N_1 = 1/4$, $\cos 2\pi N_1 = \cot 2\pi N_1 = 0$, $\csc 2\pi N_1 = 1$, and $\sqrt{\cos^2 2\omega_o - \cos^2 2\pi N_1} = \cos 2\omega_o$, then;

$$\frac{\partial e_o}{\partial e_1} = \frac{\partial e_o}{\partial N_1} = \frac{\partial \theta_o}{\partial \theta_1} = 1 - \frac{\partial \theta_o}{\partial \psi} = 0 \tag{116}$$

That is: the errors in e_o due to errors in the determination of e_1 and N_1 and the errors in θ_o due to errors in the determination of θ_1, are at the most of the second order, and hence negligi ble.

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Also:

$$-\frac{\partial e_o}{\partial \theta_1}=\frac{\partial e_o}{\partial \psi}=-\sec^2\omega_o \tag{117}$$

$$\frac{\partial \theta_o}{\partial e_1}=-\sec 2\omega_o \qquad \frac{\partial \theta_o}{\partial \pi N_1}=\operatorname{tg} 2\omega_o$$

The results in the two special cases are almost completely complementary. Placing them together for comparison:

1. $(\psi-\theta_o)=45^\circ \quad \omega_1=0$

$$-\frac{\partial e_o}{\partial \theta_1}=\frac{\partial e_o}{\partial \psi}=-\frac{\partial \theta_o}{\partial e_1}=\frac{\partial \theta_o}{\partial N_1}=0 \tag{112}$$

$$\frac{\partial e_o}{\partial e_1}=\frac{\partial e_o}{\partial \pi N_1}=\sec^2\omega_o$$

$$\frac{\partial \theta_o}{\partial \theta_1}=1-\frac{\partial \theta_o}{\partial \psi}=\sec 2\omega_o \tag{113}$$

2. $\omega_1=0 \quad N_1=\frac{1}{4}$

$$\frac{\partial e_o}{\partial e_1}=\frac{\partial e_o}{\partial N_1}=\frac{\partial \theta_o}{\partial \theta_1}=1-\frac{\partial \theta_o}{\partial \psi}=0 \tag{116}$$

$$-\frac{\partial e_o}{\partial \theta_1}=\frac{\partial e_o}{\partial \psi}=-\sec^2\omega_o$$

$$\frac{\partial \theta_o}{\partial e_1}=-\sec 2\omega_o \tag{117}$$

$$\frac{\partial \theta_o}{\partial \pi N_1}=-\operatorname{tg} 2\omega_o$$

The choice of a compensator to give greatest accuracy in the measurement of elliptically polarized light depends therefore upon the relative accuracy of the measurement of e_1 and θ_1, the ellipticity and azimuth of the compensated light. If e_1 can be measured with the greater accuracy, a quarter-wave plate gives the more accurate determination of θ_o, while a plate of lower order, $\pi N_1=\omega_o$ approximately, gives the more accurate determination of e_o. If θ_1 can be measured with the greater accuracy, the reverse is the case.

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12. Errors in the Use of Stokes's Analyzer

The errors involved in the use of Stokes's analyzer or Mr. Tool's halfshade modification of it, are, when a calibrated compensator is used, given by the results of the previous section. When, however, an uncalibrated compensator is used, or the analyzer is employed in calibrating a compensator, the errors are different. Considering the elliptic halfshade a balanced halfshade, the equations are:

$$\cos 2\omega_o = \frac{\sin n}{\sin c} \quad \text{and} \quad \cos 2\pi N_1 = \frac{\operatorname{tg} n}{\operatorname{tg} c} \tag{42}$$

In the notation of the previous section:

$$c = \frac{\pi}{2} - 2(\psi - \theta_o) \qquad n = \frac{\pi}{2} - 2(\psi - \theta_1)$$

Then

$$\delta e_o = \frac{\partial e_o}{\partial e_1}\delta e_1 + \frac{\partial e_o}{\partial \theta_1}\delta\theta_1$$

$$= \frac{\mathrm{d}e_o}{\mathrm{d}\omega_o}\left[\frac{\partial \omega_o}{\partial c}\frac{\partial c}{\partial \psi} + \frac{\partial \omega_o}{\partial n}\frac{\partial n}{\partial \psi}\right]\frac{\partial \psi}{\partial \omega_1}\frac{\mathrm{d}\omega_1}{\mathrm{d}e_1}\delta e_1 + \frac{\mathrm{d}e_o}{\mathrm{d}\omega_o}\frac{\partial \omega_o}{\partial n}\frac{\partial n}{\partial \theta_1}\delta\theta_1$$

and

$$\delta(\pi N_1) = \frac{\partial(\pi N_1)}{\partial e_1}\delta e_1 + \frac{\partial(\pi N_1)}{\partial \theta_1}\delta\theta_1$$

$$= \left[\frac{\partial(\pi N_1)}{\partial c}\frac{\partial c}{\partial \psi} + \frac{\partial(\pi N_1)}{\partial n}\frac{\partial n}{\partial \psi}\right]\frac{\partial \psi}{\partial \omega_1}\frac{\mathrm{d}\omega_1}{\mathrm{d}e_1}\delta e_1 + \frac{\partial(\pi N_1)}{\partial n}\frac{\partial n}{\partial \theta_1}\delta\theta_1$$

From equations (12) and (25) letting $\measuredangle(o,1) = \psi$

$$\sin 2\omega_1 = \frac{S_1}{P_1} = \sin 2\omega_o \cos 2\pi N_1 + \sin 2(\psi - \theta_o)\cos 2\omega_o \sin 2\pi N_1$$

or:

$$\sin 2(\psi - \theta_o) = \sec 2\omega_o \sin 2\omega_1 \csc 2\pi N_1 - \operatorname{tg} 2\omega_o \cot 2\pi N_1$$

Evaluating the differential coefficients required, substituting values from equations (109) for functions of $(\psi - \theta_o)$ and $(\psi - \theta_1)$ and introducing the condition $\omega_1 = o$:

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$$\frac{de_o}{d\omega_o}=\sec^2\omega_o \qquad \frac{\partial\psi}{\partial\omega_1}=\frac{1}{s(\omega_o,\omega_1)}$$

$$\frac{d\omega_1}{de_1}=1 \qquad \frac{\partial\omega_o}{\partial c}=-\tfrac{1}{2}\frac{\cos 2\omega_o\cos 2\pi N_1}{s(\omega_o,\omega_1)}$$

$$\frac{\partial\omega_o}{\partial n}=\tfrac{1}{2}\frac{\cos 2\omega_o}{s(\omega_o,\omega_1)} \qquad \frac{\partial n}{\partial\theta_1}=+2 \tag{118}$$

$$\frac{\partial n}{\partial\psi}=-2 \qquad \frac{\partial c}{\partial\psi}=-2$$

$$\frac{\partial(\pi N_1)}{\partial c}=-\tfrac{1}{2}\frac{\cos 2\omega_o\cot 2\omega_o}{s(\omega_o,\omega_1)}\sin 2\pi N_1$$

$$\frac{\partial(\pi N_1)}{\partial n}=\tfrac{1}{4}\frac{\csc 2\omega_o\sin 4\pi N_1}{s(\omega_o,\omega_1)}$$

where

$$s(\omega_o,\omega_1)=\sqrt{\cos^2 2\omega_o-\cos^2 2\pi N_1}$$

then

$$\frac{\partial e_o}{\partial e_1}=-\frac{2\sec^2\omega_o\cos 2\omega_o\sin^2\pi N_1}{\cos^2 2\omega_o-\cos^2 2\pi N_1}$$

$$\frac{\partial e_o}{\partial\theta_1}=\frac{\sec^2\omega_o\cos 2\omega_o}{\sqrt{\cos^2 2\omega_o-\cos^2 2\pi N_1}} \tag{119}$$

and

$$\frac{\partial(\pi N_1)}{\partial e_1}=\csc 2\omega_o\sin 2\pi N_1\frac{\cos^2 2\omega_o-\cos 2\pi N_1}{\cos^2 2\omega_o-\cos^2 2\pi N_1}$$

$$\frac{\partial(\pi N_1)}{\partial\theta_1}=\tfrac{1}{2}\frac{\csc 2\omega_o\sin 4\pi N_1}{\sqrt{\cos^2 2\omega_o-\cos^2 2\pi N_1}} \tag{120}$$

For $\omega_o=\pi N_1$, i.e. the maximum ellipticity, which the compensator can reduce to plane polarized light, all of these differential coefficients become infinite, and the expressions for e_o and N_1 reduce to indeterminate forms. Stokes's method, with an uncalibrated compensator, is therefore, valueless for ellipticities approaching 1.

For any given value of e_o the coefficients $\frac{\partial e_o}{\partial e_1}$ and $\frac{\partial e_o}{\partial\theta_1}$ are a minimum for $N_1=\frac{1}{4}$. Then, for greatest accuracy in measuring

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ellipticities with an uncalibrated compensator, the compensator should be approximately a quarter-wave plate. In case $N_1 = 1/4$:

$$\frac{\partial e_o}{\partial e_1} = -\sec^2 \omega_o \sec 2\omega_o$$
$$\frac{\partial e_o}{\partial \theta_1} = \sec^2 \omega_o \qquad (121)$$

These values are are a minimum for $e_o = o$. The accuracy of measurement is, therefore, greatest for small ellipticities.

For any given value of N_1, $\frac{\partial(\pi N_1)}{\partial e_1} = o$, when $\sin 2\omega_o = \sqrt{2} \sin \pi N_1$, and $\frac{\partial(\pi N_1)}{\partial \theta_1}$ is a minimum for $\sin 2\omega_o = \frac{1}{\sqrt{2}} \sin 2\pi N_1$. For low values of N_1 these two values are practically identical, and for values of N_1 approaching $1/4$ the condition $\frac{\partial(\pi N_1)}{\partial e_1} = o$ is rendered practically useless by the accompanying high value of $\frac{\partial^2(\pi N_1)}{\partial e_1^2}$. The best working conditions in calibrating a compensator by Stokes's method are therefore obtained when $\sin 2\omega_o = \frac{1}{\sqrt{2}} \sin 2\pi N_1$, for all values of N_1. Introducing this condition:

$$\frac{\partial(\pi N_1)}{\partial e_1} = \sqrt{2} \operatorname{tg}^2 \pi N_1$$
$$\frac{\partial(\pi N_1)}{\partial \theta_1} = 2 \cot 2\pi N_1 \qquad (122)$$

Stokes's method is, therefore, most accurate in calibrating compensators which are approximately quarter-wave plates.

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I.—*Financial Legislation in Principle and in History*

BY W. G. LANGWORTHY TAYLOR

Governments have sought to regulate and to monopolize not only the money of communities but also their credit. It is noteworthy as a further proof of the dominant position of credit in the financial world, especially as compared with money, that, notwithstanding the efforts of governments to control the credit system or to monopolize it for the selfish purpose of potentates or of parties, they have been able to break down, destroy, or to assimilate and absorb but a small part of the credit activity of the community. In Oriental countries, it is true, enterprise is throttled by taxation, which is the surest means to that end; but in a country where credit is well developed, the government is forced to face the problem of taxation in a spirit of scientific impartiality. The highly developed credit system of the United States will force that government into scientific methods of taxation.

Nevertheless, precisely through the channel of taxation, civilized governments have learned to use credit in a way which is especially open to the abuses which we have seen inhere in a period of highest expansion, and thus to weaken business credit. Governments seek to pay their expenses, or rather to obtain credit for their debts, by the issue of paper money. Probably no government paper money was ever issued which was not expected to be redeemed in full value at some time, although that time

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might be distant. Such a thing as fiat money has never existed as a proposition embodied in legislation. Nevertheless, the issues of government money that have not been paid, or the payment of which has been either formally or tacitly renounced, have been very numerous, and the term fiat money has been attached to them. We shall give a very brief statement of the arguments for and against the issue of government money, and follow it by some discussion of the regulation of banking by government.

Among the advantages of government paper money has been mentioned the saving of interest for the government, since by that means it is able to make a loan free of interest, whereas, if it borrowed upon bonds, it would have to pay interest. But this advantage is far overbalanced by the swollen debts[1] incurred in depreciated currency, that is to say, really at high rate of discount. It is also stated that government money is uniform and avoids multiplicity of issues by different banks; but in answer to this it may be said that it has been found easy to cause private banks to reduce their issues to uniform appearance and denomination, and that government guaranty of private bank notes gives them a uniform exchange value, if the government is a sound one.

It is true that, in times of war, finance ministers have frequently resorted to issues of government paper. The argument has been made that it was necessary. That argument was made with especial cogency at the beginning of the civil war in the United States. Here and there a rigorous economist of the orthodox school, like Professor Simon Newcomb, the economist-astronomer, raised his voice in protest.[2] It was claimed that the credit of the government in the form of paper money was no better than in the form of bonds, while the paper money, by virtue of its legal tender quality, caused the circulation and prices of the country to fluctuate in value with great violence and brought an unnecessary uncertainty into business. This, indeed, is the strongest indictment against government paper money. It is worthy of note that

[1] Professor W. C. Mitchell estimates the loss of the United States Treasury from this source, on account of the civil war, at over one-fifth of the war debt. *History of the Greenbacks*, p. 419.

[2] *A Critical Examination of Our Financial Policy during the Southern Rebellion.* Appleton, 1865.

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the most enlightened governments have been able to restore or preserve a good medium of exchange even when the credit of the country was heavily strained. For instance, the Russian and Austrian governments, without any notable reduction of the public debt, have in recent years restored their money system to a fairly sound condition.

Nevertheless, at the moment of catastrophe, when means of somehow coming to a temporary understanding with a vast body of creditors that have suddenly sprung up, as if from the dragon's teeth sown by Cadmus, seem to be imperatively needed, it has been found impossible to avoid a temporary issue of paper money. This was true of the French government at the time of the Franco-Prussian war. It is to be remarked, however, that the French paper money was issued, not directly by the government, but as notes of the official state bank. One can see that it is simpler for the government, under such circumstances, to give visible receipts for the services performed by contractors and soldiers than it would be to keep a book account of such vast debts. Under such circumstances, it is incumbent upon the government to fund such receipts or warrants as quickly as possible, in order that the evil effect of their use as a circulating medium may be speedily terminated. Accordingly, the French government began its payments to the bank as early as the year 1874, in order to enable the latter to contract its issues, and resumption of specie payments was effected early[1]—January 1, 1878—whereas, not until a year later did the United States resume payment of debts that had been put into the form of government money ten years before the Franco-Prussian war.

It was said by Professor Newcomb[2] that the national banks were not an improvement upon direct loans by the government, as a means of borrowing by the issue of paper money, since their credit would depend upon the credit of the government, so long as their reserves contained government paper money rather than specie. In time of war, however, if the exigency of the moment is very great, finance ministers resort to all sorts of expedients,

[1] Dunbar. *History of Banking*, p. 143.
[2] *Op. cit.*, ch. VIII.

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and, in our country, a great many different forms of money were invented in order to avoid the appearance of an over-issue of any one kind. This was as truly a means of deceiving the public as many resorted to by promoters of private schemes.

One of the greatest disadvantages of government money issues is that, in the present state of public knowledge on such matters, they cater to a popular misconception as to the nature of the circulating medium, namely, the idea that if anything can be made to work as a *circulating medium* it must also be a successful and trustworthy *standard of value*. The public is quite willing to be deceived as to the circumstances in which the function of a circulating medium may be separated from that of a store of value. However, that disadvantage may be gradually remedied by education.

Another disadvantage, perhaps greater, is inelasticity of government issue. Even where banks are compelled to put up bonds as a guaranty for their circulation, there is usually some provision for expanding or contracting the currency, even though that may take place slowly. Where the government establishes a state bank and merely interferes in its operation through appointment of its officers, as in France and Germany, the circulation may be highly elastic; but where the government issues paper money to pay for supplies and services to the government, taking back the paper money again simply in payment of taxes or of certain kinds of taxes, there is no possibility of expanding and contracting it according to the needs of business. It has been, indeed, proposed that the currency should be systematically contracted and expanded according to the price of gold, but it will be noticed that the changes in the volume of currency effected by this artificial manipulation could not take place until after the price of gold had fluctuated; consequently some fluctuation in the value of the circulating medium would occur before means could be taken to restore the disturbed parity between the paper money and the gold. The remedy is based upon the hypothesis of a disease.

But the whole fallacy of the proposition lies in the simple fact that we have here an attempt to supplant a private circulation by a public circulation. This, in the nature of things, can never suc-

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ceed, for it has already been demonstrated that the circulating medium of the country consists in the guaranties accompanying private business contracts. Those guaranties are there and must be there to do the work. They can not be excluded, except by stopping the work of circulation altogether, or at least by stopping the creation of the congeries of contracts which is necessary to uphold the structure of business. In order to carry on business without such contracts, it would be necessary that every particular act of production, down to the smallest, should be directed from a central bureau. Such a state of affairs would amount to a prohibition laid upon private arrangement and private contracts, or, in other words, to an abolition of all thought or responsibility on the part of the people. But there is nothing too absurd for the imagination of scheme makers. Fortunately, in the United States, where government money circulates, it has been impossible to prevent dealing in deposits or entirely to exclude the use of bank notes.

The government is not a producer of industrial values, in the ordinary sense of the word. It is not to be denied that government does produce the values of security, of the administration of justice, of public recreation; it also does produce some industrial values in the shape of lighthouse protection, regulation of rivers, building of roads, and sometimes the building or ownership of canals and of railroads, and even of theaters; but one can readily see that these undertakings will not be pushed forward at periods which will correspond to the fluctuations in private business. In fact, public works are often carried on in periods of depression, in order to give work to laboring men. However beneficial such charitable activities may be, it is not perhaps to the benefit of commerce that attempts should be made to expand the circulation at a moment when the healthy action of the organism of business requires contraction. Moreover, the product which the government elaborates is not sold in the market for goods; it is apparently given away. Payment comes in the form of taxation. If the government apparently pays for these good things with paper money, the paper money must be redeemed some time or other by means of taxation. Ordinary business

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credit is taken up when the goods are sold and new government credit is substituted. The substitution of payment by means of taxation for payment by means of sale and liquidation with further organic credit is like the mixing of oil and water. The movement of government credit does not correspond with the movement in private credit and is a decidedly disturbing factor.

For instance, preceding a crisis, it is highly desirable for specie to be exported from a country, in order that bankers and other debtors may be stimulated to exert a pressure upon those who, in turn, owe them, and thus, throughout the whole credit structure, responsibility be encouraged and bad business be weeded out. The crisis should thus be averted by its early precipitation. *Similia similibus curantur!* In a country, however, even with such a small proportion of government money as has the United States, it has been found that this money has left the reserves of the banks and floated to the seaboard in attempts to cross the ocean, but, like the potato bug, has been unable to do so. There, heaped up in the vaults of banks in the great seaports, it has encouraged speculation at a moment when that should have been discouraged. The bears in Wall street readily seize a period of depression combined with easy money to hasten on a catastrophe which otherwise might have passed over with a moderate and reasonable period of liquidation.[1] The disadvantage from government that flows from its depreciation and the consequent ruin of creditors has been so often exemplified in history and has been dwelt upon so much that we hardly need to discuss it further.

Probably one thing that induces the public to vote for government paper money is the idea that government credit is better than private credit. Undoubtedly, in time of peace, government credit is better than that of most corporations, but it certainly is not better than that of the whole business community, whose credit, as we have seen, is generalized in the circulating medium, so that each portion of the latter depends upon the solvency of the whole.

Another popular fallacy which has supported the policy of gov-

[1] F. M. Taylor, *Do We Want an Elastic Currency?* Political Science Quarterly, vol. 11, March, 1898.

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ernment paper money is the total misapprehension as to the organic origin of money. This mistake is unavoidable, since the perception of the truth in this matter requires no ordinary ability and education. It is a point, like excessive protection, on which, perforce, we must resign ourselves to wait for the growth of public opinion. It is popularly supposed that money "represents" present goods, and that it acts as a circulating medium for this reason. Hence the whole brood of propositions that have been made and attempted to be enforced, from early times, to "coin all the production of the country into money." It has been looked upon by several party conventions in the United States, as a self-evident proposition, that the money of the country represented its produce, and that, therefore, the value of the produce should be coined in order to circulate it. It was not supposed that a proposition of that sort needed the slightest discussion; it was not supposed necessary to stop for a moment to be more precise about the word "represent." This is a point that even students of political economy have not squarely met. The recent development, however, of the theory of subjective values enables us to make the deduction that money does not represent the present goods, but represents future goods, and consequently the inflationist's argument, so far as it is grounded on a false quantity theory and neglects the natural, organic genesis of credit in unexecuted contracts, falls to the ground.

Another objection to government money is that, while there is a gain in payment of interest, the usual depreciation of it puts upon the shoulders of the government, when the day of reckoning arrives, a burden far out of proportion to the values received. For instance, it is estimated that the United States has paid several times what the civil war cost, on account solely of the depreciation of the paper money issued. Private parties lose on any money which they happen to hoard, not only the depreciation, but also the high interest that they are compelled to pay if it is borrowed, in order to make up to the creditor, who expects to be paid in such money, for the depreciation of his principal. Creditors lose in so far as they have not foreseen the extent of the depreciation. Curiously, when paper money begins to depreciate, the

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argument is always made that more money should be issued, in order to lower the rate of interest. Doubtless, before depreciation is very pronounced, a small additional issue of money will have a temporary effect to lower the rate of interest in the locality where it is issued; but, when the depreciation is rapid and has gone very far, probably no effects of this sort would be noticed. Finally, an issue of government paper money is a confession of bankruptcy on the part of the government; it probably tends to lower the government credit more rapidly than the issue of government obligations in any other form. It is astonishing what a vast quantity of government bonds can be absorbed, if only some time be given in which to issue and market them, whereas the field for government issues of paper money is strictly limited.

Passing now over to the question of government regulation of private credit, we shall confine ourselves chiefly to government regulation of the most prominent credit institutions, namely, banks. The following is a short account of the development of the credit theory as applied to banks, of the growing appreciation of it by governments and by bankers, and, in general, of the attempts to bring bank regulation into conformity with the real needs of banking. It will be seen that this question, like any other, presupposes a knowledge of the facts before it can proceed to intelligent discussion, and that, when the facts are once known, the hardest parts of the discussion have already been accomplished.

Here we may pause to remark that what is known as theory, and often condemned as such, is really nothing but an attempt to get at the facts. To a person that has not made this attempt it appears to be unnecessary, because the facts are supposed to be self-evident or to depend simply upon observation. On the contrary, facts are not self-evident, and they depend upon an observation which, to say the least, can not be made with the outer eye. The facts once agreed upon, the measures of government to be taken will depend upon abuses that have been experienced, but also upon the popular conception of what the facts are. The measures taken by government upon the facts connected with a particular form of social service, such as banking, are never the

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same as they would be if the people at large had a different or more correct idea of what the facts were. A law is a compromise between the popular error as to what the facts are and what would otherwise be the logical conclusion from the facts themselves.

Misconception as to the organic nature of credit has given rise to discussions concerning the elasticity of the circulating medium, and especially of bank money. The clearing up of this discussion has depended upon the working out and popularizing of the idea that "business makes money." In England, William Dunning McLeod, and in the United States, Professor Charles Franklin Dunbar, are chiefly to be thanked for the prominence they have given to this principle. It has been, however, extremely difficult to bring it into a clean-cut form, even with the help of catchy phrases. The supposed distinction between notes and deposits has been the stumbling block in the way of a clear conclusion, for the theory of banking does not contrast them with each other, but both with reserves. The popular materialistic preference for notes and the perverted term "deposit" have led to endless confusions.

Originally, a banker was a dealer in money. He sat behind a table or "bank" holding his money, and was little more than a money changer. It became easy, however, for him to do business in exchange, in other words, to buy and sell money for future delivery; and in that way he made loans, but these operations were looked upon purely from the materialistic side. The notes and deposits that he soon learned to give in making his loans were called "money." The financial world, even up to the top, has always been obsessed by the tyranny of this verbal confusion between the bailment of material money in return for hire, analogous to the hiring of a horse at a livery stable, and the making of promises for future delivery of money, instead of perceiving that those promises for future delivery were not meant to be carried out literally, but were simply used by business men as a guaranty for the fulfilment of business contracts. Money theories have kept as closely as they could along popular, materialistic lines, and have treated notes and deposits as money, and looked

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upon their value as subject to the same laws as those to which a commodity is subject. Among the inflationists, the fallacy persists in a crude form, "that money is what money does," that is to say, if the circulating function is established, the standard of value function will take care of itself. And the further fallacy persists that a bank deposit is practically money, because it is supposed to represent money deposited in a bank, whereas the literal deposit of money in a bank is but a survival of an ancient and superseded business, out of which banking indeed sprung. However, so far as application today is concerned, the notion is as fallacious as is the other that a laboring man is a slave because, in ancient times, labor was done by slaves, and because it may be historically true that the laboring man is evolved from the slave.

It is along this line of popular thought that everyday language calls a bank loan a loan of "money," and assimilates it to the hiring of a livery team. The banker is popularly supposed to be a dealer who takes people's money on deposit, that is, for safekeeping, and loans their money out *again* (lay great stress upon "again"); whereas observation shows that there is no more than the slightest grain of truth in that idea. One would think that universally the introduction of the business of the safe deposit company, the facilities of which are often used for deposit of specie, would cause people to inquire as to the difference between this revived old deposit business and the modern guaranty business; but when a form of speech is once rooted in the language it is almost impossible to eradicate the fallacies that cluster about it. A large part of the work of students in the political sciences consists in showing that new meanings attach to old terms. It is most curious that the misapprehensions here again alluded to should prevail in the face of the fact that almost everybody deals with a bank nowadays. He knows that the largest part of his deposits come from his borrowings in his business. Why should he not draw the natural conclusion that the orders which he deposits come also from loans made by the persons who have made payments to him? A simple illustration of this sort shows the crying need for economic, and especially for financial, education. Although banking business has been developed in practically its

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present form for two centuries, the popular theory is still that of the money changer on the Rialto; and yet the economist is perpetually met with the question whether there is any practical application of economic theory.

While the banker himself has accepted some of the false conclusions of nominalistic reasoning, he has rejected others, and is gradually emancipating himself from the rest. Under the direction of arbitrary legislation, he opens his profit and loss account on notes separately from that on deposits; he looks upon his notes as issued, not for loans, but for bonds, in this country, in the face of the obvious fact that he buys his bonds with his capital; and in foreign countries, where the deposit business is little developed, he looks upon deposits as a special warehousing business, although he takes the right view there of his notes. And he is only now, after years of false conservatism and confused timidity, receiving his education on the similarity of the note to the deposit, through the efforts of a few statesmen like the Hon. Charles N. Fowler of New Jersey.

As usual in any campaign of education, it has been necessary to educate the banker up to this point by inventing the new and again inaccurate phrase, "an asset currency." This phrase has taught the bankers of the United States that bank notes are merely issued in exchange for individual notes, in precisely the same sense as deposits are exchanged for individual notes, a point that was fully explained by Dunbar and McLeod thirty or forty years ago. It remains to educate the banker and the public as to the peculiar guaranty that this exchange amounts to.

In legislation on the subject of banking we must expect to find some progress, and, as already intimated, we do find it. Distinctly, the discussions of the nineteenth century have led to clearer ideas and to some improvements in legislation. The influence of professors of political economy and of closet students of finance has been, of course, quite indirect. Even what college students have learned on this subject in the last twenty-five years has not been clearly retained by them when in the later hurly-burly of life; and under the pressure of the practical need of the moment they have often lost the general bearings of what they

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had been taught. Clearer ideas on any public topic involve a modification of our ideals, and this modification, in turn, leads us into a course of conduct more in conformity with the actual conditions. These conditions, as already implied, consist not only in the physical opportunities afforded by the physical plant of modern life, but also in habits and customs which, whether they be reasonable or unreasonable, are even more slowly modified than the conceptions which we have just shown are changing to suit circumstances.

One such fixed form of thought is as to the special nature of the banking business; that it is much more important than any other business, since it involves control of all businesses. While that view is partly true, doubtless it is exaggerated and leads to exaggerated conclusions. Is the banking business so different from all other business that all the demand liabilities of the bank should be guaranteed by the government? It has been customary for some governments to guarantee the note issues of their banks, or to provide, in banking legislation, that the state bank shall itself put up a guaranty fund for the notes rather than the deposits. And from this the step seems very easy to the putting up of a guaranty for all of the demand obligations, that is to say, for the deposits also. Some countries, like France, do not guarantee even the note circulation. It is significant that the Bank of France, which already has the largest note circulation and whose business is practically entirely a note business, is subject to no legal regulation, except a nominal upper limit of note issue, and that this same bank carries the biggest reserve of any bank in the world. In other words, without legislative provision, it takes the greatest precautions to safeguard its demand obligation. It is only fair to say that the governor of the bank is appointed by the government and that there is considerable room here for government interference.[1]

But the business of raising potatoes is a business of public interest,—everybody consumes potatoes. Potatoes are needed even more than bank loans. Why should not the government guarantee the price of the potato crop? The proposition for the state

[1] Dunbar. *Chapters on Banking*, 52.

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to guarantee all bank deposits in this country is unfavorable to the principle of private enterprise; but the proposition to encourage banks voluntarily to organize themselves into a guild for the defense or insurance of their notes and deposits may be a reasonable one in the present state of public opinion on finance and in the present tendency of businesses and classes toward separatist organization.[1] Such a scheme could not be one of "free banking." The guild must pass on its own membership.

So long, however, as the idea generally prevails that a deposit is evidence of money given to the banker, and that the banker loans out the money deposited, and also the other inconsistent idea, that paper money, whatever be its source, is a long-time standard of value, those ideas will necessarily influence legislation and constitute a part of the restrictions which hinder rather than further business. It is impossible to obtain legislation in advance of the movement of popular opinion. This is a wise provision of an over-watching Providence, which has put the welfare of the whole people above that of any particular institution, such as banking, and which decrees that the imperfections of particular institutions shall not be removed until the whole people has been educated up to the highest point.

There have been two great questions to work out in banking legislation: one as to the elasticity of the currency, and the other, subordinate to the first, as to the approximation of notes to deposits. In early times, notes were used almost exclusively. The deposit business came in gradually, and for a long time it was not considered that a business in deposits was really banking; and when the question of the influence of credit upon crises first arose, bank credit was almost entirely in the form of bank notes. On June 8, 1810, during the suspension of specie payments in England, at the time of the Napoleonic wars, an investigation into the operations of what was known as the bank restriction act of 1797, whereby the Bank of England was allowed to refuse payment on its notes, and in consequence of which the price of

[1] For an account of the workings of the Oklahoma deposit guaranty law, vid. W. C. Webster, *The Depositors' Guaranty Law of Oklahoma*, Jour. Pol. Econ., vol. 17, no. 2, Feb., 1909.

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gold and the price of exchange rose considerably in England, led to the making of the famous *Bullion Report*, which is, perhaps, the most masterly document that ever issued from a legislative committee.

The most of the *Bullion Report* is occupied by a convincing argument that the rise in foreign exchange and in commodity prices was due to inflation of Bank of England notes, as a consequence of the exemption of the bank from the obligation to pay specie on demand. The key-note of the report is that financial legislation is interference, and that "sound money" is furthered by leaving the banker exposed to his natural obligation as a debtor. But the *Bullion Report* saw clearly the need of loaning according to the demands of business; in other words, that business makes money, that the amount of loans is practically equal to the amount of business. And it went further and indicated that deposits performed the same function as notes. This statement at that early period is so remarkable that it deserves quotation:

"The effective currency of the country depends upon the quickness of circulation and the number of exchanges performed in a given time, as well as upon its numerical amount; and all the circumstances which have a tendency to quicken or retard the work of circulation render the same amount of currency more or less adequate to the amount of trade. A much smaller amount is required in a high state of public credit than when alarms make individuals call in their advances, and provide against accident by hoarding; and in a period of commercial security and private confidence, than when mutual distrust discourages pecuniary arrangements for any distant time. But, above all, the same amount of currency will be more or less adequate, in proportion to the skill which the great money dealers possess in managing and economizing the use of the circulating medium. Your committee are of opinion that the improvements which have taken place of late years in this country, and particularly in the district of London, with regard to the use and economy of money among bankers, and in the mode of adjusting commercial payments, must have had a much greater effect than has hitherto been

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ascribed to them, in rendering the same sum adequate to a much greater amount of trade and payments than formerly. Some of those improvements will be found detailed in the evidence: they consist principally in the increased use of bankers' drafts in the common payments of London; the contrivance of bringing such drafts daily to a common receptacle, where they are balanced against each other; the intermediate agency of bill-brokers; and several other changes in the practice of London bankers are to the same effect, of rendering it unnecessary for them to keep so large a deposit of money as formerly."[1]

The Bank Act of 1844, known as Peel's act, professed to be founded upon the principles of the *Bullion Report,* which, however, in some respects, was profoundly misinterpreted by the act, for the *Bullion Report* was infused with the spirit of freedom that prevailed at the time that it was written; whereas Peel's act endeavored to restrict the issues of the bank within the narrowest limits. The *Bullion Report* understood that notes were issued in response to the needs of commerce, whereas Peel's act looked upon the issue of notes as an issue of money. Peel's act, therefore, looked upon notes as a standard of value, whereas the *Bullion Report* looked upon them as a means of circulating goods.

The act fell into this error, doubtless, also, through the influence of the materialistic reasoning of the economist Ricardo, whose doctrines, correct as they are in many respects, and hedged about with every safeguard against absurdity of conclusion, nevertheless gave a wrong turn to analysis of money and credit. Ricardo was trying to account for the level of prices, and jumped at the apparently obvious conclusion that the contraction of the amount of paper money affects the level of prices in the same way that it is affected by the similar movement of metallic money.[2] Peel's act, accordingly, sought to make every paper pound in circulation as good as a gold pound. It required that for every pound of paper money, i. e. Bank of England notes, issued, a corre-

[1] *The Bullion Report,* Sound Currency, vol. II, no. 14, p. 23. Vid. also, W. G. Sumner's *History of American Currency,* Appendix.

[2] David Ricardo. *Principles of Political Economy and Taxation* (E. C. K. Gonner, ed.), par. 125.

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sponding pound of gold should be put in the reserve. Doubtless the effect of this legislation was to accelerate the use of deposits, since no real credit business could be done under legislation of this sort.

In order to drive this legislation to its logical conclusion, let us suppose, for instance, in this country, that a "popular" policy should require the banks to put up a dollar of gold for every dollar of deposits that appeared upon their books. Unless some new financial expedient were immediately discovered whereby business guaranties could continue to be independently made, it is little exaggeration to say that business enterprise would come to a standstill, and that the lawyer would have to make his own shoes, and the shoemaker would have to plead his own cause, until, at least, the antiquated money system could be resurrected. But is is not probable that any such extravagance will be legislated, for the simple fact that the logic of events is more powerful than the logic of the street corner. Business must have its guaranty, no matter what the politicians, or the legislatures, or the statute books think about the matter. Government guaranty of deposits also is calculated to weaken free competition and hence responsibility in banking. It gives the politician-banker an advantage over the tried, experienced banker, and discourages the latter.

We must look upon the *Bullion Report* as an academic production, and upon Peel's act as an attempt and a beginning of legislative reform. It is admitted to have had the good effect of stimulating the banking department of the Bank of England to keep a larger reserve in time of crisis, and thus, indirectly, to have brought into greater prominence the difference between circulating and guaranty functions. The act also recognized that inflation comes through credit, although it made the big mistake of thinking that it comes solely from expansion of notes; for it attempted to prevent crises by restricting the issue of notes alone. The banking department, consequently, was caught with an insufficient reserve against deposits several times thereafter, until it learned its lesson from experience. It had little to learn from the act.

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The first two United States Bank acts, those of 1781 and 1816, recognized the resemblance of notes to deposits to this extent, that they did not mention the distinction between the two in limiting the amount of obligations into which the bank might enter to twice the capital together with the reserves; but, as already mentioned, deposits were in those days insignificant in this country as well as in Europe, and probably were not thought of especially in the framing of that provision. The present National Bank Act made formally a backward step by restricting its guaranty fund to the notes loaned. Of course, it could not have guaranteed deposits by a dollar-to-dollar guaranty. The mention of notes at all is a symptom that deposits were, by that time, 1864, becoming more important. But the act made a step forward in limiting the amount of notes loaned to the capital, and thus allowing obligations in the form of deposits to be increased indefinitely. Finally, in 1894, under the stimulus of the general financial discussion that was going on in the country, a plan was presented at the annual meeting of the American Bankers' Association, held in Baltimore, which proposed to do away with the deposit of government bonds as security for the notes, but to secure the notes by a guaranty fund to be raised by a tax upon the bankers as a guild.

This idea is bearing fruit and has thoroughly permeated recent, general, intelligent discussion of the banking question. Men are beginning to ask, Why should bank notes be absolutely secured, especially when bank deposits are not thus secured and can not be? It is true that reformers of the more popular order, taking the other horn of the dilemma, are asking why should not bank deposits be made just as safe as bank notes? In general appreciation of intelligent people, the "banking principle" in spirit is now getting the upper hand above the "currency principle." The movement is not confined to this country. "The proposition to make a rigid requirement to invest deposits and reserves in absolutely good securities is not a new one; but it is impracticable. Among other bad effects, it would completely paralyze a bank which desired to make a judicious investment of the resources that it had acquired from third parties; good bills of exchange,

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drawn by solvent persons, are preferable to a portfolio full of stocks and bonds subject to the fluctuations of the stock exchange and which could not be sold on a falling market in the case of a crisis. Almost all banks invest temporarily in government bonds, but the English banks have learned to their cost the disadvantage of holding English consols for the last two years. Those banks have been compelled to change their investment in order to stop the effect of the depreciation of the 'best security in the world,' which had fallen in a few years from 114 to 91."[1] While the language of Raffalovich is that of business rather than that of science, it shows plainly the evils of banking on bonds, and, incidentally, of government interference in the banking business. The same point has been made by Juglar.

It may be noted in passing that the object of American legislation with respect to banks has been different from that of English. In England it has sought to prevent crises by making inflation impossible; in the United States the object has been more democratic, namely, to provide absolute security for the circulation. It has been supposed that notes were more used by the common people, and hence more deserving of protection. Protection of this sort, however, has been accompanied by inelasticity. It would appear, at first sight, that the small circulation in the United States, compared with the business done with deposits, would make the question of elasticity of the circulation of comparatively little importance. There is much truth in this view, and perhaps that is one reason why the country has been so behindhand in obtaining better legislation upon the circulation. Nevertheless, as Dunbar aptly remarks,[2] we can not tell how large the circulation might be if it were not restricted by the requirements of bond deposit. This is only another way of saying that legislative regulation confining its attention to notes, like that contained in Peel's act and in the national bank act, has stimulated unnaturally the growth of the deposit system. Are we to infer that when legislators thoroughly interest themselves

[1] Arthur Raffalovich. *Marché financier*, 1901–2, p. 62.
[2] *Op. cit.*, p. 75, sqq.

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in deposits also, the banking business will be destroyed? However, everything points to the view that the deposit system must ultimately almost entirely supersede the circulation. So long as circulation is wanted, however, it should be properly regulated, if regulated at all, and should not be regulated in such a manner as to derange the level of prices and the rate of interest, or to stimulate stock speculation.

The law of June 3, 1864, under which the national banks of the United States were organized, constituting really the third national bank of this country, abolished the limit of bank indebtedness that had been set for the first and second United States banks. This change may be looked upon as a distinct advance in the line of elasticity of bank obligations, and, in view of the restrictions imposed on the circulation, as a decided favoring (or neglect) of deposit business. On the other hand, it followed the prevailing fashion in concentrating the regulating and paternal care of government upon circulation, following in this respect the so-called "free banking system" of New York, as well as Peel's act. The inconveniences connected with this sort of regulation were keenly felt by the business world at the time of the rapid payment of the United States national debt under secretaries Manning and Windom in the ninth decade of the last century. As the debt was paid off the bonds deposited for secured circulation were rapidly retired, and the circulation with them.

Consequently, in 1894, the convention of financiers in Baltimore formulated a new plan, henceforth known as the Baltimore Plan, which proposed to follow the so-called "safety fund system," also of New York, the central idea of which was simply the formation of a fund to secure the circulation through a tax upon the banks. This proposition, of course, marked a step towards more ideal conditions, for it removed the government guaranty, and to that extent placed the circulation more on an equality with the deposits, and gave it freedom of expansion. But it was merely a project, and, as such, was the starting point of a long agitation, the end of which has not yet been reached. This movement was followed by the Indianapolis Convention of January, 1897, which discussed thoroughly the principles of monetary

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finance from a scientific point of view, and made progressive recommendations.[1]

After the strenuous monetary political campaign of 1896, and in view of the then impending campaign of 1900, congress was compelled to take action upon the action of the currency, and passed the Act of March 14, 1900, which is a monument of timidity. The first object of the act was to secure the gold standard, and this it sought to do by increasing the treasury reserve against government notes, and by giving to the United States Treasurer additional facilities of borrowing in order to maintain it. The best way to maintain the gold standard would undoubtedly be to abolish government paper money altogether, and to enforce strictly redemption of bank circulation by the banks themselves. It was not, however, felt that the country was ready for such a liberation from financial swaddling clothes; the labors of a long series of monetary reformers were neglected. So the act made a slight move towards greater note elasticity by allowing the banks to issue notes up to 100 per cent of the bonds deposited, instead of the 90 per cent theretofore permitted, by allowing them to reissue notes just after they had retired them, instead of the period of delay which a law of 1882 had prescribed, by reducing the tax on circulation, and by reducing the interest on the bonds put up as security. Action of this sort is noticeable for our purposes chiefly as showing that the question of elasticity of the currency was under actual discussion, and that the legislature, although reluctantly, was compelled to acknowledge the pressure of enlightened ideals.

The Hon. Charles N. Fowler has, in a series of often amended projects, offered to the country a measure of real reform, and must be looked upon as one of the best educators of public opinion to be found in political circles. Even his proposed bills do not go to the full extent of complete freedom of issue, but are largely influenced by the German model. He proposes to remove the bond guaranty; he advocates the safety fund; and, until his last bill, he proposed to tax additional note issues at an increas-

[1] Vid. *Report of the Monetary Commission of the Indianapolis Convention,* 1898, by J. Laurence Laughlin.

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ing rate. For some reason he has advocated, in his latest proposition, a uniform tax on all issues.

The safety fund principle would appear to be in accord with the *political* movement of the times. The tendency now is for all interests to unite, each in its own domain, thus forming separate guilds or economic classes. The consolidation of the laboring classes into national trade unions on the one hand, and of almost numberless manufacturing interests into national and international trusts, on the other hand, is an evidence of this spirit of the age. That legislation should go along to help the banks to combine into one national guild is not surprising, although quite inconsistent with the protestations of the legislature that it is deeply concerned to maintain competition which is understood by it to mean "small businesses." The law recently passed by the United States congress,[1] facilitating the union of banks in different sections of the country, is quite along this line, and, in this political sense, indicates a movement in advance, although the requirement of deposit of the private notes purchased with the emergency circulation is retained. These local associations, however, are trivial affairs, as they only have authority over the emergency circulation, which is to be taxed 10 per cent per annum. Mr. Fowler has also proposed that the banks should assume the redemption of the United States notes, and had provided a measure by which the latter should finally be paid off by the banks without expense to the government. But this enlightened provision has also been dropped.

We must content ourselves with this brief sketch of legislation on the subject of credit, designed less for information about the various acts mentioned than to afford some notion of the extent to which the organic conception of credit is getting a foothold. History of banking legislation is only one phase of the history of corporation legislation in general. Corporations were originally chartered in order to secure the benefits that would accrue to a large number of different persons of moderate means who might, by laying their capitals together, create a fund adequate to the

[1] Approved May 30, 1908.

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size of the enterprises of exploration, trade, and manufacture, which the growing markets of the modern world invited. Indeed, it has always been possible for persons of means to do this. The first encouragement from governments consisted, however, in privileges of monopoly and of the exercising of sovereign power in foreign parts, which made it seem more attractive and safe for these large partnerships to be constituted. Subsequently, the principle was extended to the more modern business enterprises of manufacturing and banking. It was noticed that the associates often suffered very seriously from legal responsibility which they were subject to with respect to enterprises over which they had little or no control, and with which they had little or no connection, except the important fact that, through the society they had formed, they contributed to them their capital. The idea that responsibility for management was all too strictly associated with contributions of capital was awakened by the fact that many of the contributors were women and minors, persons that were not supposed to be fully competent in business matters, and therefore deserving of the protection of the law. Consequently, a general course of legislation was entered upon in all countries, tending to render the associates in business enterprise free from responsibility for the failure or mismanagement of the enterprise, beyond the sums which they had severally contributed, or, as in the United States National Banks, beyond a limited multiple of such sums.

Thus, the legislative encouragement towards the laying together of capitals was followed by a separation of economic interests from economic responsibility, and out of that weakening of individual responsibility sprang up bad management, incapacity, flagrant abuse, and peculation. The attempt to cure the second series of evils was not met by removing the original cause,[1] namely, the privileges and immunities whereby the associates were induced to come together. Doubtless that could not

[1] Parallel with this remedying of the evils of limited liability of stockholders by a system of checks and balances is the remedying of the evils of note-inelasticity by a mechanical note-redemption enactment. The requirement of a pledge of bonds made the notes inelastic. The radical cure lies in the repeal of the requirement, as proposed in the Fowler bill.

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be done. The world needs large capitals, and in the event of the failure, say, of the United States Steel Corporation, it would seem ridiculous to exhaust the little remaining property of a man of small means simply because he owned a share or two in that corporation.

However, enlightened legislation should look partly in that direction. If the responsibility of the shareholder were greater, persons would be more careful in putting their means where they would have little influence in the management of them, and while the amount of capital brought together might be somewhat less, with that lessening the growth of monopoly would be checked, and the tendency would be to make the management more conservative. But our modern legislation seeks to cure the evil, not by removing the cause, but by an elaborate system of palliatives, a system of "checks and balances," by inspection, by registration, by sworn prospectuses, by prescribing the substance and form of the organization, and, finally, by official valuation of the assets. Perhaps, in the view of the state of public opinion, that is the best that could be done. Certainly there are ways of doing this well, and of doing it ill. European countries have been more thorough in this detailed legislation than the United States, although the United States is moving rapidly in the direction of elaborate checks and balances. It is to be noted that the European laws, excellent as they are and formulated by mixed commissions of legislators and economists, after inter-parliamentary sessions lasting many years, have been unable to prevent many cases of most flagrant abuses of trust, on the part of banking and other institutions, from arising. The involving of the Leipziger Bank in the failure of the Cassel Trebertrocknung concern was one of the most notable cases of this sort in recent years. "In Germany the great banks take a very active part in industry and commerce. Naturally the risk is very great, if the directors and officers are unable to resist temptation. This is the price that must be paid when financial institutions make industrial investments."[1]

Banks, along with other corporations, have gone through all

[1] Raffalovich, *op. cit.*, p. 54.

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of the stages of attempt to cure the results of bad theories of paternalism with more paternalism,—of attempts to increase competition by regulation of the form of business, rather than (what is the manifest duty of legislation) by simplifying, expediting, and sharpening remedies for wrong doing between man and man. Democratic tenderness at the possibility of offending a citizen who is a voter has played its part in this misdirected legislation, which has erected the corporation as a man of straw which can be clubbed when anything wrong happens, and thereby the sense of justice be appeased for the moment, at least, by the erroneous impression that an evil-doer has been punished.

The object of legislation should be to recognize a clear distinction between *organization* for the purposes of production, on the one hand, and *individual responsibility* on the other. The former should not be allowed to interfere with or to obscure the latter. The fact that the stockholder is removed from responsibility should not destroy the amount of personal responsibility to be located somewhere in connection with the enterprise. Some one must always be found who has the full original amount of responsibility. Apparently, the proper person is the corporation officer. Suppose that the corporation officer has small pecuniary interest in the concern and that he has no property: obviously the only way of securing responsibility is by criminal process. No organization for protection should be allowed to stand between the wrong-doer and his punishment. The official who loots the stockholders through the fiction of a corporation, and then of a construction company or similar misuse of the purposes of the corporation form, should not be protected. The courts have been heretofore too much inclined to protect evil-doers of this stripe, not because they were blind to the evil, but because they could not see their way out of the corporation legislation, and because the legal fiction of a corporate person or entity has very naturally, in the minds of men of the legal profession, overshadowed the plain economic responsibility, which is always to be found in natural persons alone. If, however, they had recognized from the first that corporation legislation was strictly for the purpose of production, and that, when it comes to a question

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of responsibility: and wrong doing there is no such entity as a corporation, perhaps they could have given a better turn to the law.

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II.—*Taxation in New Zealand*

BY JAMES EDWARD LE ROSSIGNOL AND WILLIAM DOWNIE STEWART

A. TAXATION BY THE GENERAL GOVERNMENT

The New Zealand government is different from both the Federal and the State governments of the United States in that the power to levy taxes of all kinds is practically unrestricted. Theoretically, the British government, in the exercise of its supreme legislative authority, has the right to tax all parts of the Empire, but the right is never exercised. The principle established by the American Revolution, that there shall be no taxation without representation, still bears fruit in the practical autonomy that New Zealand and the other self-governing dependencies enjoy.

Under the Constitution Act of 1852,[1] certain sums were made payable to the British government for defraying the salaries of the governor, the crown ministers, and the judges, and the list of these is known as the Civil List, but as power was given to the New Zealand Parliament to alter these amounts, with the consent of the British government, and as this power has been frequently exercised, and the Imperial government has never withheld its consent, the taxation thereby imposed is merely nominal and such as the Dominion requires to impose in its own interests.

It should also be stated that certain bills dealing with taxation, such as bills imposing differential duties which bestow exceptional advantages upon foreign over British trade, and bills which appear to be inconsistent with Imperial treaties, must be reserved for the approval of the Imperial government; otherwise the Dominion is free to regulate its commercial policy and its entire system of taxation as it sees fit.[2]

[1] 15 and 16 Vict., cap. 72.
[2] *The Constitution and Government of New Zealand,* Wellington, 1896.

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The New Zealand government is not hampered by any constitutional restrictions as to the purpose for which taxation may be levied, nor is there any prohibition of class legislation nor any clause in the Constitution Act forbidding the taking of private property for public purposes without due process of law, although as a matter of fact this is never done. The government has a free hand. It may and does levy duties on imports from Great Britain and other parts of the Empire; it imposes taxes not only for revenue but also as a means to social reform; and many of its laws, as the graduated land tax, would doubtless be regarded as class legislation by American courts. It goes without saying that cities, boroughs, counties, and the other local governing bodies derive their power to tax, as well as all their other powers, from the general government, which in its turn derives its powers from the Imperial government.

The following are the chief heads of revenue and expenditure for the year 1907–8 of the Consolidated Fund, which includes the revenue and expenditure of the post and telegraph department and the railway department, but not that of the other governmental enterprises, for which there are separate accounts.

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REVENUE AND EXPENDITURE

REVENUE	£	£	EXPENDITURE	£	£
Balance on 31st Mar., 1907		717,825	His excellency the governor	7,000	
Customs duties	3,103,565		Legislative	62,795	
Beer duty	113,973		Ministers' salaries and allowances	14,692	
Stamps (including postal and telegraph cash receipts	1,550,934		Interest and sinking fund charges	2,187,427	
Land tax	537,846		Exchange and commission	29,486	
Income tax	304,905		Pensions, civil and military	62,375	
Railways	2,765,395		Old age pensions	330,802	
Registration and other fees	129,166		Railways	1,963,428	
Marine dues	42,217		Public instruction	343,311	
Miscellaneous	218,342		Postal and telegraph services	707,146	
Territorial revenue	289,603		Judicial and legal	352,163	
		9,055,946	Hospitals and charitable institutions	145,999	
Other receipts—			Defense (including naval)	214,670	
Recoveries in respect of expenditure of previous years		8,043	Subsidies to local bodies	109,591	
			Department of agriculture	144,989	
			Mental hospitals	82,785	
			Valuation department	33,096	
			Customs	49,579	
			Marine (including harbors and lights)	66,292	
			Printing and stationery	46,261	
			Electrical	9,668	
			Registration of land and deeds, births, deaths, and marriages	31,243	
			Public buildings and domains and maintenance of roads	67,169	
			Public health department	33,253	
			Labor department	29,047	
			Tourist department	33,979	
			Contribution to civil service superannuation fund	20,000	
			Grant to New Zealand International Exhibition	21,000	
			Miscellaneous expenditure	172,551	
			Territorial expenditure	342,168	
					8,213,965
			Other expenditure—Transferred to public works fund		800,00
			Balance on March 31, 1908		767,849
		9,781,814			9,781,814

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Of the total revenue, as shown here, less than one-half was derived from taxation, and the amounts thus raised were as follows:

HEADS OF TAXATION	AMOUNT COLLECTED	Taxation per head of mean population (excluding Maoris) 1907–8
	£	£ s. d.
Customs and excise	3,217,538	3 9 6
Land tax	537,846	0 11 7
Income tax	304,905	0 6 7
Stamps (taxation only)	585,465	0 12 8
	4,645,754	5 8 4[1]

It is worth noting, as indicating a centralization of power far greater than that which exists in the United States, that the expenses of public instruction, amounting to £843,311, are defrayed by the general government, that the large sum of £800,000 was transferred to the Public Works Fund for the construction of roads and other public works, that £145,999 was expended on hospitals and charitable institutions, and that the sum of £109,591 was given in subsidies to local bodies. The total revenue of all the local bodies for the year 1906–7 was only £2,812,440. Of this amount £1,338,536 was derived from rates, licenses, and other taxes, including, in the case of the cities and many boroughs, special taxes for water and other utilities supplied by the municipal governments.

The sum total, then, of general and local taxation is about £5,984,290 ($28,000,000), or £6.3 ($30) per head of the total population. This is far greater than the total of federal, state, and local taxation in the United States, which does not exceed £4.3 ($20) per head. Of this amount 52 per cent is derived from duties on imports, and the rest chiefly from direct taxes of various kinds. The revenue from taxation has greatly increased in recent

[1] If the calculation be made including the Maoris, the amount per head of population would be £4 15s. 5d.

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years. In 1897–98 the general and local taxes were only £4.4 ($21.38) per head of the total population. This extraordinary increase in revenue has been due chiefly to the great prosperity of the Dominion during the past ten or twelve years.

CUSTOMS AND EXCISE

The subject of excise may be dismissed in a word. There is an excise duty on beer, which yielded £113,973 in the years 1907–9. The manufacture of spirits is prohibited, but the import duties on spirits yield a large revenue. In the year 1906–7, £304,733 was derived from this source. Licenses for the sale of intoxicating liquors are granted by the local bodies. In the year 1906–7 the local bodies derived £48,865 from this source, which yielded £53,635 in the year 1896–97. The revenue from licenses is declining, chiefly because of the spread of local prohibition under "The Alcoholic Liquors Sale Control Act, 1893." However, the consumption per head of alcoholic liquors has somewhat increased, probably because of the general prosperity of the people.[1]

The customs duties are the government's chief source of revenue, yielding 66 per cent of the total amount derived from taxation. The foreign commerce of New Zealand is very important. The imports for the year 1907 were valued at £17,304,861 ($84,000,000), being £18 ($87) per head of the European population. The revenue derived from customs in the fiscal year 1907–8 was £3,103,567, being 18 per cent of the value of the imports and about £3.26 ($15.84) per head of the population. It is worth noting that in the year 1906–7 the imports of the United States were valued at $1,434,421,425 (£300,000,000), being about $17 (£3.5) per head of the population, and that the customs revenue was $332,233,363 (£69,000,000), or 23 per cent of the value of the imports, and only about $4 (£0.8) per head, estimating the population at 85,000,000.

The history of the tariff may be divided roughly into three periods. During the first of these periods, extending from the establishment of constitutional government in 1854 until about

[1] *Year-book*, 1908, p. 395.

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1879, the tariff was on a purely revenue basis, although the rates were too low to secure a maximum of revenue. Before 1854 the duties were chiefly *ad valorem,* said to have been unfair to the "conscientious trader." The tariff of 1854 consisted of low specific duties on 21 selected articles. In 1873 Sir Julius Vogel again reverted to the *ad valorem* system and imposed an all-round tariff of 10 per cent. In 1878 Ballance, then treasurer of the Grey government, condemned the *ad valorem* system, saying that it had resulted in a fall in revenue of £33,788 since 1875, notwithstanding the unprecedented prosperity of the Colony. At that time the tariff comprised 250 headings, of which 98 were specific and the rest *ad valorem.* Ballance took 20 headings from the latter class and made them specific, at the same time reducing the duty on tea from 6d. to 4d. a pound and on sugar from 1d. to ½d. per pound.

The second period extends from the crisis of 1879 to the year 1900 and was dominated by the idea of securing a maximum of revenue while at the same time affording protection to colonial industries. The reaction from the boom period of the "roaring seventies" had set in, and the statesmanship of the next decade consisted chiefly in trying to make the country pay its way. Successive ministries vied with each other in seeking fresh sources of taxation to supply the deficiency. The issue of free trade *versus* protection became the chief political question of the day. Innumerable pamphlets were issued, long debates arose in Parliament, and the trade unions came into active politics for the first time on this question.

In 1879 Atkinson raised all articles then standing on the tariff at 10 per cent to 15 per cent. A commission which was set up in 1880 to report on local industries recognized the fact that the tariff was "distinctly though inequitably protective," and recommended that great caution should be exercised in making any changes except for purposes of revenue, lest one set of industries should be promoted at the expense of others. The tariff was revised in 1882 and again in 1888, when the duties on a large number of articles were raised from 15 per cent to 20 per cent, and many specific duties were raised proportionately. In 1895

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the tariff was again altered in the direction of further protection. Up to this time the highest rate had been 25 per cent. Some duties were now raised to 40 per cent, such as the duty on clothing made to order for residents in the Colony.

The third period began in 1900, when the Colony had become so prosperous and the revenue from customs duties so abundant that the Treasurer was able to take the duty entirely off kerosene, rice, and salt and to make substantial reductions on other necessaries of life. The next important step, taken by the Seddon government in 1903, was the establishment of preferential duties in favor of British goods. This did not involve a reduction in the tariff but an increase, since the duties on goods imported from Great Britain and other parts of the Empire remained as they were, while a substantial surtax was imposed on 37 classes of goods of foreign manufacture. On 9 classes of goods the additional taxation amounted to 20 per cent of the dutiable value; on 27 classes it was one-half of the duty payable under the regular schedule; while on cement the additional duty was equal to the regular duty. However, the duty on tea grown in any part of the British dominions was wholly removed except on tea in packets not exceeding one pound in weight.[1]

This additional taxation, while it did not prevent a slight increase in imports from foreign countries, seriously checked the importation of those goods on which the surtax was imposed, and was correspondingly advantageous to the colonial and British manufacturer, but especially the former. The value of the imports from foreign countries was £2,140,533 in 1903; in 1907 it was £2,360,678. In the same time the value of imports of boots and shoes from the United States fell from £102,054 to £33,466, printing paper from £40,206 to £7,577, furniture from £14,206 to £13,818, and so on, while the import of goods not subject to the surtax considerably increased. The preferential tariff had a less serious effect on goods imported from Germany, although New Zealand imports four times as much from the United States as from Germany. The combined imports from the United States and Germany amount to 75 per cent of the total imports

[1] The Preferential and Reciprocal Trade Act, 1903.

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from foreign countries. The preferential tariff, therefore, is protective in its character rather than productive of revenue, and is shrewdly contrived so as to give a maximum of benefit to the New Zealand manufacturer and a minimum of advantage to his British competitor, whom, at first sight, it appears to favor.

In 1906 a reciprocity treaty was entered into with South Africa, involving a reduction in the duties on feathers, wines, sugar, tobacco, maize, fish, and tea, the admission of dried and green fruits free of duty, and a reduction of 25 per cent on all other goods except spirits. As the trade between the two colonies is insignificant, little importance as yet attaches to this treaty.

A revision of the tariff was brought about in 1907 under the direction of the Minister of Customs, the Hon. J. A. Millar. The chief features of the new act are as follows:

1. Some more articles of household use, as sugar and molasses, were placed upon the free list in furtherance of the principle of a "free breakfast table."

2. Reduction or abolition of the duty on the raw materials of colonial manufacture.

3. Further protection to local industries.

4. Further extension of the principle of preference to British goods, or, rather, discrimination against non-British goods, so as to cover in all 198 items.[1]

It is not likely that the tariff will be touched again for some years to come. At present the duties of the ordinary tariff range from 5 per cent to 40 per cent; those of the preferential tariff run as high as 50 per cent or more, as in the case of the cheaper grades of American-made shoes. The tariff is approved of in the main by the manufacturers and workers, although the manufacturers claim that they do not receive sufficient protection to compensate them for the high wages they are obliged to pay under the awards of the Arbitration Court. The farmers, as a class, are opposed to the tariff, holding to the policy commonly known as the "three F's"—Freehold, Free Trade, and Free Contract. There are also people who consider that the indirect taxes

[1] The Tariff Act, 1907.

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are far too high, and that relatively more revenue should be raised by the land and income tax, death duties, and other direct taxes. The followers of Henry George, who are quite numerous, hold the usual single-tax doctrine, that the whole revenue should be raised by a single tax on the unimproved value of land. The government pretends that it has made substantial "concessions" from time to time since the year 1900, but these have been more than counterbalanced by increased duties in other directions. In the year 1900 the revenue from customs was 17.85 per cent of the value of the imports; in the year 1908 it was 17.99 per cent of that value. As in the United States, so in New Zealand, promises and pretenses of tariff reduction are largely illusory.

THE LAND AND INCOME TAX

As far back as the year 1844, Lord John Russell sent a circular letter to the colonial governors of Australia and New Zealand recommending a tax on land as the form of taxation most suitable to the conditions prevailing in a new and growing community, but thirty-five years elapsed before such a tax was imposed. In 1844 Governor Fitzroy, who was an ardent advocate of free trade, passed an ordinance abolishing customs duties and substituting a graduated property and income tax of 1 per cent on property and income combined up to £1,000, but no taxpayer was liable for more than £12. The change was welcomed by the traders and whalers, but the settlers ignored and evaded the law, which soon failed as a means of raising revenue, and was replaced by a new customs tariff. No further attempt was made to impose direct taxation until 1878.

At that time the colony was prosperous, though on the eve of a crisis, and Ballance considered that the burden of taxation should be readjusted, in order to make the landowners pay a larger share of the interest on the public debt, which had been incurred chiefly for the building of roads and railways, which had greatly increased the value of land. Ballance's Land-tax Bill was carried, but stirred up much opposition, and, after the fall of the Grey government in 1879, the Act was repealed.[1]

[1] Land-tax Act, 1878. Reeves, *State Experiments*, vol. 1, p. 258.

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Atkinson now brought forward a bill to establish a general property tax on the American model, and the Act was passed on December 19, 1879.[1] It provided for a tax of one penny in the pound (five-twelfths of 1 per cent) on all assessed real and personal property, with an exemption of £500. Atkinson admitted that much was to be said in favor of taxing used lands held for speculative purposes, but considered the policy impracticable. An income tax, also, he rejected as "too inquisitorial and unavoidably open to great inequalities," nor did he think it desirable to attempt to break up the large estates by means of a progressive land tax. The property tax remained in force until September 8, 1891, when it was repealed. The following table shows how the tax was paid in the year 1881:

AMOUNT OF TAX	NO. OF TAXPAYERS
Under £1	5417
£ 1 and under £ 5	9048
5 and under 10	3267
10 and under 20	2146
20 and under 50	1390
50 and under 100	480
100 and under 200	194
200 and under 300	66
300 and under 400	27
400 and under 500	14
500 and under 1000	23
1000 and under 2000	12
2000 and under 3000	1
3000 and under 4000	0
4000 and under 5000	1
5000 and under 6000	0
6000 and under 7000	1
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The property tax, though by no means onerous, soon became unpopular, chiefly among the small farmers and tradesmen. The usual objections, some valid, but many trivial and baseless, were urged against it. The small farmers disliked paying taxes, however small, upon buildings, implements, and live stock. They suspected their rich neighbors of successful evasion. The trades-

[1] Property Tax Act, 1879.

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men thought that they paid too much as compared with professional and salaried people, although they shifted a large part of the tax to the shoulders of their customers. It was said that income from property paid too much as compared with income from professional services and salaries. Also, it was held that the law took no account of the earning power of a man's capital, and that people doing a large business on a small capital paid less than their fair share, quite ignoring the tendency of profits towards equalization. Mr. Reeves said in Parliament that the tax was equal to an income tax of 4s. in the pound on a man who was making 6 per cent on his capital, and only 6d. in the pound on a man making 17 per cent.[1] Mr. Reeves also says: "Manufacturers, shopkeepers, and trading companies also found the tax unjust. It hit them as hard in bad years as in good.[2] This, of course, is an objection that can be urged against almost any form of taxation, since a government requires practically as much revenue in bad years as in good, and a system of taxation which would yield a fluctuating revenue would be highly unsatisfactory.

Mr. Reeves further says: "To these solid grounds for discontent was added the sentiment nourished by the writings of George and Wallace. Avowed single-taxers were, indeed, very few in number, as they still are; but the doctrines of land-nationalizers and single-taxers were acceptable to the extent of distinguishing between real estate and personal property as subjects for taxation. A line was also drawn between ground values and improvements. Large tracts of most of the great freeholds were unimproved. Feeling ran high against land monopoly in 1890, and higher still against absentee ownership. The land and income tax bill of Ballance was greeted as a measure of revolution. It did indeed herald a species of political revolution, which is still in peaceful progress."[3]

Another reason for abolishing the property tax was that the government required more revenue, and it was thought that this could be secured more easily by taxing the wealthy classes than

[1] *Parl. Debates,* vol. 71, p. 190.
[2] *State Experiments,* vol. 1, p. 259.
[3] *State Experiments,* vol. 1, p. 260.

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by increasing the tax on property in general, which would have aroused a storm of opposition. But, whether rightly or not, the property tax was condemned by the small farmers and tradesmen, and when, in 1891, these classes got the upper hand, with Ballance, the author of the land tax of 1878, as premier, they repealed the Act of 1879 and passed the Land and Income Assessment Act in its stead.

Behind all the arguments against the property tax was the determination of the small proprietors to pay little or nothing in the way of direct taxes, but to make the wealthier people pay all. They also wished to break up the large estates, and in this they were strongly supported by the laboring class, who desired that they or their sons might occupy relatively improved and well-situated land instead of having to endure the hardships of pioneer life in the back blocks. Again, the small proprietors, who were mostly borrowers, wished to get at the money lenders by means of a tax on mortgages. Also, they used the arguments of single-taxers and other theorists in so far as it suited their purpose to do so, although the small farmers, who formed the backbone of the new democracy, were anything but single-taxers. A special tax was levied upon absentee landholders, who were thought to be a particularly undesirable class of citizens, and the income tax was designed to tax the wealthy mercantile, manufacturing, and professional people of the towns.

The original act[1] has been amended from time to time. The Consolidation Act of 1900 is now in force, with later amendments. The most notable features of the Act are the ordinary land tax, including the tax on mortgages on land, the graduated land tax, the tax on absentee owners, the graduated income tax, and the total exemption of small properties and incomes.

The ordinary land tax is assessed on the unimproved value, that is, the capital value less the value of all improvements. The Act of 1891 allowed deductions for improvements up to £3,000, but, by the amendment of 1897, the value of all improvements was exempted. The rate is fixed by the annual taxing act. At

[1] Land and Income Assessment Act, 1891.

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present it is 1d. in the pound on the unimproved value. Owners of land of which the unimproved value is £500 or less pay no tax.

The tax on mortgages on land was formerly the same as the tax on land, but in 1902 the rate was lowered to ¾d. in the pound and has not since been changed. The tax is paid by the mortgagee, that is, the mortgagee and the mortgagor are treated as joint owners of the land. In making up the total assessed valuation on which an owner pays taxes, the amount of mortgages owing by him is deducted from the unimproved value, while the amount of mortgages owing to him is added thereto. If such net value is not over £500 the owner pays no taxes; if it is £1,500 he pays on £1,000 and there are diminishing exemptions up to £2,500, at which point the exemption ceases and the owner pays on the full unimproved value.

When the tax on mortgages was first imposed it was said that it would fall on the borrowers, since the lenders would charge a rate of interest sufficiently high to recoup themselves. Mr. Reeves states that such has not been the case,[1] but the tax was small and its effects were obscured by changes in the rate of interest due to other causes. From 1891 until about 1898 the rate of interest on mortgages declined, but afterwards rose. In the year 1898–99, about 58 per cent of the money lent on mortgages was lent at 5 per cent or less, but in the year 1906–7 only 53 per cent was lent at such rates. It seems probable that, if the tax had not been imposed, the rate of interest would have fallen more during the former period and would not have risen so high in the past few years. At the present time, which is a time of financial stringency, borrowers find it hard to get money either from the government or from private lenders, and the chambers of commerce of the Dominion seem to be unanimous in the opinion that the mortgage tax prevents capital from coming to New Zealand, and forces New Zealand capitalists to lend their money elsewhere.[2] Certainly, a good deal of New Zealand capital has been invested abroad in recent years.

The government is urged to abolish the mortgage tax and to

[1] *State Experiments,* vol. 1, p. 261.
[2] *Evening Post,* Wellington, April 13, 1909.

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make incomes derived from mortgages subject to the income tax. To do this would be to sacrifice some revenue and to discriminate against resident lenders, who could not evade the income tax, but the borrowers would probably gain more than the government would lose. For this reason it would be only fair to make them pay additional taxes on their land. The total revenue from the land tax, including the tax on mortgages, for the year 1907–8 was £537,846. For the year 1906–7 the revenue was £447,342, of which the ordinary land tax yielded £321,413 and the graduated land tax, including the tax on absentee owners, yielded £125,929.

The graduated land tax, which was designed chiefly to compel the large holders to sell or otherwise subdivide their estates, has recently been altered in the direction of increasing the tax on the larger holdings.[1] It begins with a tax of $^1/_{16}$ of a penny in the pound when the unimproved value in any assessment is not less than £5,000 and is less than £7,000, and increased by sixteenths to $^{18}/_{16}$ of a penny when the unimproved value is between £35,000 and £40,000. When the unimproved value is £40,000 the rate is suddenly increased to 8s. in every £100 (0.4 of 1 per cent), and for every additional £1,000 of unimproved value the rate is increased by $^1/_5$ of a shilling in every £100. The rate reaches its maximum at £200,000, when it is 2 per cent on the total unimproved value. For and after the year ending March 31, 1910, the progressive taxes on estates over £40,000 are to be increased by 25 per cent in the case of land other than business premises.

The total ordinary and graduated taxes paid by the owners of very large estates are now very heavy. An estate of which the unimproved value is £200,000, exclusive of business premises, pays a graduated tax of 2½ per cent in addition to the ordinary land tax of 1d. in the pound (0.41 of 1 per cent), making 2.91 per cent in all. But the graduated tax is increased by 50 per cent in the case of absentee owners, so that the absentee owner of an estate of which the unimproved value was £200,000, if such an estate existed, would pay a tax of 4.16 per cent. By the Amended

[1] An Act to Amend the Land and Income Assessment Act, 1900. October 26, 1907.

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Act of 1907 a person is deemed to be an absentee "unless he has been personally present in New Zealand for at least one-half of the period of four years immediately preceding the year in and for which he is assessed for graduated land-tax."[1]

The land tax, together with other legislation and the natural tendency toward the division of large holdings, a tendency not so strong in pastoral as in agricultural countries, has doubtless had some effect in reducing the size of the great estates. In the year 1896–97, 17.5 per cent of the holdings were of 320 acres and over and 90 per cent of the total acreage was thus held, while in 1907–8 such holdings were 20.94 per cent of the whole and comprised 87 per cent of the total acreage. These figures do not show any marked change, and it was not to be expected that they would, for an estate of 320 acres is a relatively small holding in a pastoral country like New Zealand. The great estates, however, show a considerable decline both in number and per cent of acreage. In 1896–97 there were 501 holdings of 10,000 acres and over, containing 54 per cent of the total acreage, and in 1907–8 there were 484 of such holdings, containing 44 per cent of the total acreage. In 1896–97 there were 112 holdings of 50,000 acres and over, comprising 30 per cent of the total acreage, while in 1907–8 there were only 84 estates of this class, comprising only 22 per cent of the total acreage.[2]

But some, at least, of these estates, instead of being broken up and sold to small holders, have been divided among the members of families, before or after the death of the owners, so that the power of these families remains almost as great as before, while the government loses something in the way of graduated tax. This loss has not been great, having amounted to only £9,153 in the ten years 1896 to 1906. The government has lost a good deal more by having purchased and subdivided certain large holdings, as the Cheviot estate. The total loss in graduated taxes that would have been paid had the estates remained intact has been estimated at £82,909 for the ten years from 1895 to 1905.[3]

[1] 7 Edw. 7, 1907, no. 18. *Year-book*, 1908, pp. 563, 669.

[2] *Year-book*, 1908, p. 469.

[3] Returns Presented to Parliament from the Land and Income Tax Department, B.–24b., and B.–24a., Session of 1905.

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But the graduated tax was originally designed to break up the large estates, and when this work is accomplished the revenue which it now yields will have to be raised in some other way.

An official return presented to the House during the session of 1906 showed that there were 63 rural estates with an unimproved value of £50,000 and upward, 14 with an unimproved value of £100,000 and upward, one estate of 218,866 acres valued at £214,978, and one of 101,221 acres valued at £276,118. The capital value of these great estates was £296,990 and £335,405. During the session of 1906 the government brought in a bill to limit the holdings in rural land of any individual or company to an unimproved value of £50,000. The bill met with strong opposition and was dropped, and in the session of 1907 the act which has been described was passed, which, although condemned by some as a socialistic measure, has the merit of being logical and practicable, which could hardly be said of the previous plan. A return laid before the Council by the Valuation Department during the session of 1907 shows that there are no longer any estates in New Zealand having an unimproved value of £200,000 or over.[1]

The taxation of unimproved values naturally brought about a radical change in the methods of valuing property, but before the year 1906 there was no uniformity in this matter. The Land and Income Tax Department periodically employed a small army of temporary valuers, and every local authority had its own method of making up its roll for the levying of rates. But on October 17, 1896, the Government Valuation of Land Act was passed (since amended several times), for the purpose of securing uniformity in valuation, particularly in the administration of the land tax and the rating on unimproved values.[2]

The Act provides for the appointment of a valuer-general and district valuers to hold office during pleasure. The district valuers reside in their districts, soon become expert in their work, and generally command the confidence of the people. There is little or no corruption or bribery. At first the valuation was

[1] Return to an Order of the Legislative Council, dated July 26, 1907, no. 8.
[2] *Year-book*, 1908, p. 594.

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about 10 per cent less than the true selling value, but presently much less, because of increase in land values. At present, however, the valuation seems to be rather high from the investor's point of view. The valuation is not made at stated times, but is constantly being revised, although it is sometimes out of date. The officials say that there are no insuperable difficulties in the way of determining unimproved values as distinguished from the value of improvements.

The Act of 1896 defined unimproved value as "the difference between the total capital value of the whole property and the total capital value of all buildings and improvements," but the definition was found to be inadequate, and the amendment of 1900 gives a number of more elaborate definitions, thus:

"*Capital value* of land means the sum which the owner's estate or interest therein, if unincumbered by any mortgage or other charge thereon, might be expected to realize at the time of valuation if offered for sale on such reasonable terms and conditions as a *bona fide* seller might be expected to require."

"*Improvements* on land means all work actually done or material used thereon by the expenditure of capital or labor by any owner or occupier of the land; nevertheless, in so far only as the effect of such work or material used is to increase the value of the land, and the benefit thereof is unexhausted at the time of valuation, but shall not include work done or material used on or for the benefit of land by the Crown or by any statutory public body, unless such work has been paid for by the contribution of the owner or occupier for that purpose; provided that the payment of rates or taxes shall not be deemed to be a contribution within the meaning of this definition."

"*Land* means and includes all land, tenements, and hereditaments, whether corporeal or incorporeal, in New Zealand, and all chattel or other interests therein, and all timber or flax growing or standing thereon; provided, that native bush or native trees which have been planted for shelter or ornamental purposes on an area not exceeding twenty-five acres shall not be included in the definition of land in this section."

"*Owner* means the person who, whether jointly or separately,

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is seized or possessed of or entitled to any estate or interest in land."

"*Unimproved value* of any piece of land means the sum which the owner's estate or interest therein, if unincumbered by any mortgage or other charge thereon, and if no improvements existed on that particular piece of land, might be expected to realize at the time of valuation if offered for sale on such reasonable terms and conditions as a *bona fide* seller might be expected to require."

"*Value of improvements* means the sum by which the improvements on an owner's land increase its value; provided, that the value of improvements shall in no case be deemed to be more than the cost of such improvements estimated at the time of valuation, exclusive of the cost of repairs and maintenance."

The valuation of all the land and improvements in New Zealand was completed in 1898. The unimproved value was given as £84,401,244, and the value of improvements £54,196,103. In the year 1908 the unimproved value was £161,324,763 and the value of improvements £92,115,409. The valuation is useful not only as a basis for taxation but as a basis for the granting of loans and as a guide to all who desire to ascertain for any purpose the selling value of land.[1] However, the Advances to Settlers Office has its own valuers, and the work of the valuation department does not seem to be regarded as final, even by the government. Certainly, private lenders and purchasers do not blindly follow the government's valuation, but, on the contrary, the government seems to have too closely followed market values.

Of late years there has been a good deal of speculation in new lands, and speculative values have in many cases run ahead of permanent investment values, and the Valuation Department has been accused of encouraging speculation by overvaluing the land. In a recent debate in the House, Mr. T. Mackenzie said: "The tendency of the department has in recent years been in the direction of unduly increasing the unimproved value and undervaluing the improvements, which is entirely wrong, and against the spirit

[1] *Year-book*, 1908, sec. 20.

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of the Act." Mr. Major said: "The unimproved value of land is always assessed at a higher rate than it should be, and the valuation for improvements is invariably too little. That is brought about by reason of the fact that there are certain improvements that are lost sight of, and are not visible to the eye of the average valuer. Some of the valuers are not sufficiently competent to assess the improvements at their true value."[1]

There are several other reasons why the valuation tends to be too high. In the first place, the department wishes to make a high valuation in order to secure a large revenue from the land tax. Secondly, the government likes to show a high valuation because it is an indication of prosperity and strengthens the Dominion's credit in the loan market. Thirdly, owners like to have a high valuation when they come to sell their land or to borrow from the Advances to Settlers Office or from private lenders. Fourthly, if the owner insists on a low valuation, the government may purchase the land at the owner's valuation. True, the owner has, under the Act, the right to demand that the government purchase his land at the government's valuation, or to have his valuation reduced, but there may be reasons why an owner might not want to do this. At any rate, there has been little protest against the government's valuation until recently, when speculative values have fallen off and the land tax has become a burden. The government has promised to revise the valuation and it is probable that it will be considerably reduced.[2]

The income tax is complementary to the land tax, being levied upon incomes derived from sources other than land and mortgages on land. It is a graduated tax, with an exemption of £300 ($1,458), which, however, is not allowed to absentees. Life insurance premiums on the taxpayer's own life are exempted up to £50. On the first £1,000 of taxable income, after allowing the exemptions, the rate is 6d. in the pound (2.5 per cent); on incomes in excess of £1,300 the rate is 1s. in the pound (5 per cent). For example, a person with an income of £300 would pay no tax; a person with an income of £1,300 would pay 2.5 per cent on

[1] *Parl. Debates,* vol. 144, p. 427, August 26, 1908.
[2] *Evening Post,* Wellington, March 9, 1909.

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£1,000; and a person having an income of £2,300 would pay 2.5 per cent on the first £1,000 and 5 per cent on the second £1,000. Companies enjoy no exemptions, and their incomes are taxed at the rate of 1s. in the pound, but friendly societies, building societies, savings banks, cooperative dairy companies, and charitable and educational institutions are wholly exempted from the income tax. No distinction is made between incomes derived from property and those derived from earnings.

The department is very strict in the administration of the tax, using an elaborate system of inspection and investigation and inflicting penalties for incorrect or fraudulent returns, so that there is very little concealment of incomes derived from investments in New Zealand. The tax on incomes from investments abroad could be more easily evaded. The yield of the income tax for the year 1907–8 was £304,905 ($1,500,000).

Farmers complain that they are taxed more heavily than merchants and professional men, but, in view of the large profits which they have gained in recent years, and the great increase in the value of their land, they do not seem to have any serious grievance. Besides, although the land tax, when first imposed, may have been a considerable burden, later purchasers, allowing for the capital value of the tax, have paid less for the land than they would have paid if there had been no tax, and thus, in a sense, they pay no tax at all on the profits of farming. Again, profits in all kinds of business tend to equality, and no class of people except landowners can derive a permanent benefit from exemption from taxation. Also, the small farmers, as well as the small shopkeepers and all other people of small means, are wholly exempted from the land and income tax, which is paid altogether by the more well-to-do people, and of these the more wealthy pay the greater part of the taxes. The land tax, therefore, is quite different from the single tax proposed by Henry George, who would have society appropriate the whole rent of land, whether owned by large or small proprietors.

The success of the small proprietors in getting rid of the burden of taxes by substituting the land and income tax for the hated property tax was truly remarkable. In the year 1889 the num-

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ber of taxpayers paying property tax was 26,327, or 4.3 per cent of the population (exclusive of Maoris). In the year 1892–93 there were 12,360 persons paying land taxes and 3,448 paying income taxes, making in all 15,808 taxpayers, or 2.5 per cent of the population. In fact, the number of taxpayers was somewhat less than this, since some persons paid both land and income taxes. In the year 1889 there were 2,242 persons under the class "working storemen, mechanics, laborers, shepherds, etc.," who paid in property taxes £4,053; in the year 1892–93 there were only 249 persons in this class, paying only £543 in land and income taxes. In the year 1889 there were 3,156 persons in the class "tradesmen, wholesale and retail shopkeepers, etc.," paying £14,721, and 8,611 persons in the class "graziers, sheepfarmers, etc.," paying £81,544; in the year 1892–93 there were 1,809 persons in the former class, paying £11,978, and 5,883 persons in the latter class, paying £89,341. In the year 1889 the property tax yielded £354,167; in the year 1892–93 the land and income tax yielded £374,088.[1]

The number of persons paying land and income taxes has increased both absolutely and relatively since 1893, because of more careful administration and because of the increase in wealth of a considerable class of the people, formerly struggling farmers and shopkeepers. In the year 1907–8 there were 28,991 persons paying land taxes, out of 150,000 freeholders and 24,179 Crown tenants. In the same year there were 10,420 persons paying income taxes, making in all 40,411 taxpayers, or 4.3 per cent of the population, paying in all £842,751. In the session of 1903 a return was laid before the House showing that out of 115,713 landholders only 15,864 paid any land tax at all, while of these 9,287 paid less than £5 apiece, so that by far the greater part of the taxes were paid by 6,577 landholders.[2] The same condition prevails at the present time. The number of persons paying direct taxes is very small compared with the total population or with the number of voters, and to this may be traced much of the

[1] *Report by the Commissioner of Taxes, C. B. Crombie,* July 28, 1893. *Year-book,* 1893, p. 425.

[2] *Landholders and Land Tax,* 1904 B. 20.

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laxity in public expenditure characteristic of the democracy of New Zealand. Back of this inequality in the payment of taxes lies, of course, a corresponding inequality in the distribution of wealth.

STAMP DUTIES

A large revenue is raised by means of stamp duties, amounting to £585,465 in the year 1907–8. These taxes are paid upon a great variety of instruments, including affidavits, agreements, annual licenses of companies, assignments, bills of exchange, promissory notes, bank notes, bills of lading, sea insurance policies, certificates of incorporation, conveyances, deeds, receipts, transfers of shares, letters of administration.

The duty on receipts is 1d. (2 cents), irrespective of value received. The duty on transfer of shares begins with a duty of 1s. (24 cents) when the purchase money does not exceed £50 ($243); when it exceeds £20 and does not exceed £50 the duty is 2s. 6d. (60 cents); for every additional £50 the duty is 2s. 6d. Upon any transfer of shares not an actual sale the duty is 10s. ($2.40). These duties are obviously intended to discourage speculation in shares.[1] The duty on bank notes is equal to one-half of 1 per cent upon the average quarterly circulation. The maker of a promissory note pays a duty of 6d. (12 cents) for any sum not exceeding £25, 1s. for any sum exceeding £25, and not exceeding £50, and 1s. for every additional £50 or part of £50. The duty on bills of lading is 1s., paid by the consignee. The duty on leases is 2s. 6d. when the yearly rent does not exceed £50, and 2s. 6d. for every additional £50.

A considerable revenue is derived from licenses granted to racing associations and other users of a betting machine called the totalisator. The duty is 1½ per cent upon the gross takings. In the year 1907–8 the total takings of the totalisator were £1,999,757, and the government's share was £29,996 ($145,000).[2]

An important source of revenue is the progressive tax on the

[1] An Act to Consolidate and Amend the Laws Relating to Stamp Duties, 1882.

[2] Stamp Acts Amendment, 1891. *Year-book*, 1908, p. 638.

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estates of deceased persons, which is high, rising to 13 per cent in the case of large estates left to strangers in blood. The duties are levied according to the following schedule:

1. When the value does not exceed £100	No duty	
2. Upon any amount exceeding £100 but not exceeding £1,000—		
On the first £100	No duty	
And on the remainder	2½	per cent
3. Upon any amount exceeding £1,000 but not exceeding £5,000	3½	per cent
4. Upon any amount exceeding £5,000, and up to £20,000	7	per cent
5. Upon £20,000 and any amount over that sum	10	per cent
6. Strangers in blood, excepting adopted children	3	per cent additional

Property left to husband or wife of the decedent is not dutiable. The duties apply also to deeds of gift, so that persons of wealth can not legally evade the tax by giving their property to their heirs before their death. Such transactions are very carefully watched, and there is very little evasion of the duties, which yield about £250,000 ($1,250,000) a year.[1]

It is impossible to estimate exactly the revenue derived from stamp duties; for in some cases, as in affixing stamps on receipts, ordinary postage stamps are used, and the revenue from the sale of these is counted as part of the revenue of the Post and Telegraph Department.

The people of New Zealand are very much taxed, notwithstanding the fact that the government carries on a number of enterprises which one would think should yield a profit and so afford relief from taxation. But these governmental enterprises are not managed so as to earn profits, and in some cases they result in a deficit. The railway deficit for the year 1907–8 was about £230,000 ($1,017,000), about twice the revenue derived from the beer duty. The interest on the net public debt, that is, the gross debt less the value of productive investments, was about £1,000,000 ($486,000), more than enough to eat up the entire revenue from the land and income tax. Then there is the sum of £330,802, given to the aged poor in the form of pensions, which

[1] An Act to Enforce and Collect Duties on the Estates of Deceased Persons, 1881. Amendment Act, 1885.

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is about two-thirds of the revenue from the stamp duties. There has also been some extravagance in the public administration, due chiefly to the prosperity that has prevailed during the past ten years. Finally, there has been for some years a large surplus of revenue over expenditure, most of which has been transferred to the Public Works Fund, chiefly for public buildings, roads, and bridges.

It is possible, and even probable, that there will be reform in public expenditure in the near future. The government has lately announced its intention to try to make the railways pay at least the interest on the capital cost. It is possible that the unproductive part of the public debt may some day be paid off and the enormous burden of interest be thereby taken away. The government has recently proposed a drastic system of economics in the civil service, which, as Sir Joseph Ward said, "will effect a total saving exceeding a quarter of a million sterling ($1,200,000), and this, so far as the portion affecting the public service is concerned, without impairing its efficiency or inconveniencing the public in any way."[1]

But it is not at all likely that these or other economies will bring relief to the taxpayers. There may be a larger surplus to spend on roads and bridges, or some of the public debt may be paid off, or the amount expended on old-age pensions may be increased, but it is not likely that taxes will be diminished, for the political power has for the most part passed away from the wealthy class, who pay most of the taxes, into the hands of a democracy of relatively poor people who are now taking their turn at exploiting the rich, and regard the capitalist as a cow to be milked or a goose to be cherished for the sake of its golden eggs.

B. LOCAL TAXATION

The revenue of the cities, boroughs, counties, road boards, and other local governing bodies is derived only in part from taxation. In the year 1906–7 their total revenue was £2,812,440, of which £192,932 was received from the general government,

[1] Speech of Sir Joseph Ward at Upper Hutt, April 2, 1909. The *Press*, Christchurch, April 3.

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£1,386,459 from licenses, tolls, rents, and other sources, and £1,233,049 from rates. Of this amount £889,716 consisted of general rates, and £343,337 special and separate rates, for water and other special purposes. The sum of £79,593 was raised by licenses, and £25,894 by other taxes, making £1,338,536 altogether, which sum is equivalent to £1 9s. 8d. ($7.18) per head of the European population. Since the total of general and local taxation is equal to £6.5 ($31.59) per head of the European population, the local taxes are only about one-fourth of the total. The relative unimportance of the local bodies is largely due to the fact that the system of public instruction is wholly supported by the general government, at a cost of £843,311 in the year 1907–8. The general government also grants large subsidies to the local bodies.[1]

Before the year 1896 rates might be levied upon the capital value or the annual value of real estate, at the option of the local authorities. The Rating Act defines *annual value* of property as "the rent at which such property would let from year to year, deducting therefrom twenty per centum in the case of houses, buildings, and other perishable property, and ten per centum in case of land and other hereditaments, but shall in no case be less than five per centum of the fee-simple thereof." *Capital value* is defined as "the sum at which the fee-simple of any ratable property, if held in possession free from incumbrances, is assessed."[2] The system of rating on annual value is preferred by most of the boroughs, while the counties usually levy on the capital value.

The passage of the Land and Income Assessment Act of 1891 called the attention of the local bodies to the possibility of a third form of rating, the rating on unimproved values, which had been strongly urged by the followers of Henry George. Besides, there were the usual objections to the existing methods of rating, and there was a certain amount of speculation in land, which in some places was withheld from sale and kept unimproved in anticipation of enhanced values. The laboring class, too, complained of

[1] *Year-book*, 1908, p. 299.

[2] An Act to Consolidate the Law for Regulating the Making and Levying of Rates. October 9, 1894.

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high rents. Also, the proposed Government Valuation of Land Act, passed on October 17, 1896, promised to give the local bodies a basis for taxation without expense to them. For all of these reasons, but largely through the activity of a few "single-taxers," the Rating on Unimproved Value Act, of August 13, 1896, was passed, giving the local bodies a third option in regard to the basis on which rates might be levied. The bill was first introduced as part of the General Rating Bill in 1893, and then as a separate bill in 1894, 1895, and 1896, in which last mentioned year it was finally passed. In every case the Upper Chamber was responsible for its rejection. One of the most interesting points in the debates was the strong country element among the advocates of the bill. It might have been thought that, if the measure was to be regarded as a step towards single tax, it would have excited unbounded hostility from the rural constituencies. On the contrary, many of the best speeches in support of the bill came from rural representatives, and some of the best in opposition to it came from the city and borough members. Several speakers who championed the bill strongly disavowed any leanings towards what one of them called "that infamous proposal, the single tax." Needless to say, the bill was heartily supported by the few single-taxers in Parliament. Mr. O'Regan enthusiastically declared that "even Henry George himself could not have drafted a more logical bill than this." A good deal of reliance was placed on the fact that a similar act had been passed in Queensland in 1890. Indeed, one industrious historian unearthed the interesting discovery that under an old provincial ordinance in Taranaki in 1858 rating on unimproved values had there been in operation for many years. The ordinance stated that "within the town district an uniform rate per cent to be assessed on the value of all lands within the district, exclusive of all buildings, erections, and improvements whatsoever, shall in every case be imposed, such value to be ascertained as hereinafter provided." This ordinance was in operation for many years before Henry George became an influence in the colony. Since this form of taxation is a partial application of the principles of Henry George, it is of more than local interest and deserves more than passing notice.

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RATING ON UNIMPROVED VALUES

The Act provides for local option in taxation, in that boroughs, counties, town districts, road districts, and other rating bodies may decide as to whether their rates shall be levied on the unimproved value, as determined by the government's valuation, or upon the annual or capital value of real estate as formerly. A written demand, signed by from 15 per cent to 20 per cent of the ratepayers, according to the number of ratepayers in the rating district, must first be presented to the chairman of the district, requesting that the Act be submitted to a vote of the ratepayers, and the vote must be taken between twenty-one and twenty-five days after delivery of the demand.

Under the original act it was necessary for at least one-third of the ratepayers to vote, and a majority of their votes carried the proposal. Because of this provision the Act failed to be carried in a number of districts, but now the Local Government Voting Reform Act of 1899 provides that a bare majority of the valid votes recorded is sufficient to adopt the Act. If the Act is adopted, no rescinding proposal can be submitted to the ratepayers until the expiration of at least three years, and if a rescinding proposal is carried no adoption proposal may be submitted until after three years have elapsed.

Section 20 of the Act reads as follows: "This act shall not apply to water rates, gas rates, electric-light rates, sewage rates, or hospital and charitable-aid rates." The reason for the exclusion of these rates was that, as they represented service to buildings alone, they should be exceptional rates and be levied upon the gross value and not on the unimproved value.[1] In committee Mr. O'Regan, an ardent single-taxer, moved an amendment having for its object the levying of these exceptional rates on the unimproved value, but this was lost by a large majority.

A similar attempt was made during the parliamentary session of 1905, when a bill was introduced into the House by Mr. Henry George Ell to amend the principal act so as to permit the local authorities to levy "all or any of the rates mentioned in sec. 20

[1] *Parl. Debates,* vol. 85, p. 192, 1896.

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upon the unimproved value." This proposal excited great opposition and a spirited debate, and the bill was lost. It shows, however, that the single-taxers of New Zealand are not satisfied with the small measure of land taxation which they have secured, and that they favor local option only as a means to an end, and, if possible, would make rating on unimproved value not optional but mandatory in every rating district in the Dominion.

Up to May 15, 1899, the Act had been submitted to the ratepayers in 23 districts, and in 21 cases received large majorities, the minorities in most cases being remarkably small. In 8 cases less than one-third of the ratepayers voted, and the Act was rejected, but in all of these districts it was carried at a later date. Up to March 31, 1906, the Act had been rejected by 12 districts and adopted by 69, including 2 cities out of a total of 4, 19 counties out of 97, 38[1] boroughs out of 97, 9 road districts out of 214, and one town district out of 32. In the year 1904 the Act was carried by 6 districts and rejected by 1; in 1905 it was carried by 6 and rejected by 6; in 1906 it was not voted on in any district; in 1907 it was carried in 4 districts and rejected in 2. On March 30, 1908, the borough of North-east Valley, which had adopted the Act on January 12, 1905, by a vote of 202 to 172, voted to rescind by a vote of 354 to 185. This is the first case of rescission, although three other proposals to rescind have been made, and in two cases a strong opposition was developed. In the third case

[1] The boroughs represent the class of local bodies in which the evils of land speculation are most felt. Their populations range from a few hundred to 10,000. They come midway in the scale of local bodies. They are neither purely rural nor purely urban. Their improvements constitute a greater percentage of their value than do the improvements in the rural districts. At the same time these improvements are not uniformly distributed. The boroughs contain many vacant sections—sometimes held in blocks for a rise in value—sometimes held as grazing paddocks. Hence, in the boroughs, the evils of land speculation press on the notice of even the casual passer-by who may never have heard of the doctrines of Henry George. At the same time it is in the boroughs that cases of hardship most frequently occur. Some market gardener or small dairy farmer finds himself confronted with increased rates, while he himself is void of offense so far as concerns the evils against which the system is ostensibly directed. These two considerations account to some extent for the large number of boroughs which have voted, and also for the rejection, in some cases, of the proposal. No doubt, also, the concentration of population as compared with the counties makes it easier to obtain a vote.

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the vote on both sides was less than when the Act was carried. The vote is seldom a large proportion of the total ratepayers.

The indifference of many ratepayers to the rating on unimproved values is probably due chiefly to the fact that the rates in most districts are not a heavy burden upon the owners of property. The general government supports the public schools and many charitable institutions, spends large sums of money on roads and other public works, bears the expense of valuation, and even grants subsidies to the local bodies. The chief items of local expenditure are for roads, bridges, drainage, harbors, charitable aid, and hospitals. Besides, over half of the local revenues are derived from licenses, rents, governmental subsidies, and other sources. In the year 1906–7 the total revenue from rates in all the local bodies was £1,233,049, and of this amount only £889,711 was derived from the general rates, which are practically the only rates that can be levied upon the unimproved value. In the same year the total unimproved value was £149,682,689, so that the total general rates were only 0.6 of 1 per cent of the total unimproved value. In counties and small boroughs the rates are low, but much higher in the larger towns. In Wellington the general rate is 0.83 of 1 per cent of the unimproved valuation, in Christchurch (Central Ward) 1.2 per cent, in Invercargill 1.2 per cent, in Devonport 0.6 of 1 per cent, in Stratford 1 per cent, and in North-east Valley 1 per cent. These figures show clearly that the rating on unimproved values is by no means a thoroughgoing application of single-tax principles.

On April 5, 1906, the Secretary of State of the British Government sent the following telegram to the governors of New South Wales, South Australia, and New Zealand: "Please send home, as soon as possible, any reports or other information available as to the working of taxation on unimproved land, both for municipal and State purposes. Information especially desired as to effects of land value taxation on building trade, on rent, on incidence of taxation on house property and vacant sites respectively, and on land speculation.—Elgin."

In compliance with this request the New Zealand government sent a circular to all local authorities rating on the unimproved

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value, asking for a report on the lines required, and 52 replies were received. A digest of the reports was made and forwarded to the British government on July 9, 1906, together with a memorandum on the subject by Mr. P. Heyes, the Commissioner of Taxes. This, with the reports from South Australia and New South Wales, was published as a blue-book by the British government in November, 1906.[1]

Of the 52 replies received about 38 were fairly satisfactory, but only a few covered all the points about which information was requested. The following is a rough classification of the replies:

1. There is a general agreement that rents have not been reduced, and that the incidence of taxation has been changed, so as to fall more heavily upon unimproved land and upon land on which there are improvements the value of which is less than the unimproved value. Out of 11 opinions concerning the justice of this change of incidence, 4 say that it is more equitable, while 7 say that it is unjust or onerous.

2. As to speculation in land, 15 replies say that it has been discouraged, and only 1 holds the contrary opinion, while 3 say that vacant sites have been broken up and put upon the market.

3. As to the building trade, 12 say that it has been encouraged, 8 think that it has not been affected, 1 says it has been discouraged, and 1 holds that it has been unduly stimulated to the point of overcrowding.

4. Out of 25 replies expressing opinions as to the general popularity of the system, 20 say that it is satisfactory or beneficial, and 5 say that it is not so.

On the whole, the replies were not very satisfactory, perhaps because the questions were not sufficiently specific, but more probably because of the difficulty of forming a just opinion of the effects of such legislation or even of the state of public opinion on the subject. Besides, the replies show a tendency to theorize, and in many cases represent merely personal opinions of the officials as to the effects that might be expected to follow the intro-

[1] Papers relative to the Working of Taxation of the Unimproved Value of Land in New Zealand, New South Wales, and South Australia. London, 1906.

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duction of the new system. This is markedly true of the memorandum of Mr. Heyes, who seems to interpret the facts from the viewpoint of a confirmed single-taxer. However, Mr. Heyes is in a better position to observe the effects of the system than the town clerks or other local officials, and his opinion must be accorded much weight. Summarizing the results of the investigation, he says: "*In the large majority of cases* the system has been only a short time in force and in these cases no opinion is expressed as to the merits or otherwise of the system. It is extending more rapidly as the effect is seen in the places where it is adopted and it becomes better understood. The reports, as will be observed, show the results to have been beneficial. From the reports received, and the most reliable sources of information available based on personal observation and inquiry, I am of opinion that the effect of the system of rating on the unimproved value would be correctly summarized on the lines required as follows:

"*Building Trade:* The effect has certainly been to greatly stimulate the building trade. The object and tendency of this system of taxation is to compel land being put to its best use, so that the greatest amount of income may be derived from it, and rendering it unprofitable to hold land for prospective increment in value. It has been the direct cause of much valuable suburban land being cut up and placed on the market and thus rendered more easily available for residential purposes, and of the subdivision of large estates in the country, resulting in closer settlement.

"The effect on urban and suburban land has been very marked. It has compelled owners of these to build or sell to those who would—it has thus caused a great impetus to the building trade. An owner of land occupied by buildings of little value, finding that he has to pay the same rates and taxes as an owner having his land occupied by a valuable block of buildings, must see that his interests lie in putting his land to its best use. The rebuilding of this city (Wellington) which for some years past has been rapidly going on is largely attributable to the taxation and rating on land values, so that the supply of building materials could not at times keep pace with the demand.

"*Rent:* The tendency of this system of taxation is not to in-

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crease rent, but, on the contrary, as the tax becomes heavier, it tends to bring into beneficial occupation land not put to its best use and *so reduces rent,* the improvements being entirely free from all rates and taxes. In *some cases* where land suitable for building sites is limited high rents have been maintained, notwithstanding the tendency of the system.

"*Vacant Sites:* The effect has been to cause vacant sites being put to their best use by expenditure on improvements. On vacant sites the rates and taxes are increased and continue to increase as the adjacent sites which have been improved increase in value. It thus becomes unprofitable to continue to hold land unimproved.

"*Incidence of Taxation:* The taxation, on building property, where the improvements exceed the unimproved value, is decreased; where the unimproved value exceeds the improvements the taxation is increased.

"*Land Speculation:* The tendency is to discourage speculation as the tax partially or wholly discounts the rise in value, but land speculation has not ceased in some districts where the system has been adopted, because:

"(1) The tax has not been sufficient to render speculation unprofitable in the large cities, though it has been a factor to be reckoned with.

"(2) The rapid increase in values has caused speculation in spite of the tax.

"In my opinion the exemption of all improvements (in conjunction with the Lands for Settlement and Advances to Settlers policy of the government) has to a large extent contributed to the solid prosperity of the Colony."

Before the government's report was accessible the present writers made a similar investigation by means of a series of questions sent, in December, 1906, to the clerks of all the local bodies, 69 in number, that had adopted the Act. Forty replies were received, of which 35 gave fairly satisfactory answers. The questions and a summary of the replies are here given:

1. Has the system had any marked effect in discouraging the holding of land for speculative purposes? Yes, 12; no, 19; indefinite, 4.

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2. Has the system unduly forced people to part with land used for private gardens? Yes, 4; no, 22; indefinite, 9.

3. Do you attribute to the system any alteration in the prosperity of your county, district, or borough? Yes, 7; no, 22; indefinite, 9.

4. Has the system caused any appreciable increase of buildings or other improvements? Yes, 12; no, 14; indefinite, 9.

5. Has the system caused buildings to be erected in advance of requirements? Yes, 3; no, 32.

6. (*a*) Do you consider the system to work equitably? Yes, 19; no, 9. (*b*) Do you know of any cases of hardship? If possible, give details. Yes, 14; no, 10.

7. Has it had any effect in (*a*) cheapening land, or (*b*) making it easier to get? (*a*) Yes, 5; no, 28. (*b*) Yes, 12; no, 22.

8. Do the ratepayers and public seem satisfied with the system? Yes, 22; no, 3; indefinite, 10.

In further explanation of these questions and answers it should be noted:

1. The tax is too slight to have any marked effect in discouraging speculation, especially in view of the general rise in land values, but in a number of cases weak holders have been compelled to sell to stronger holders, or to buyers of small lots for building.

2. In a few places, as in Wellington, where there is a great scarcity of building sites, the tendency already existing toward overcrowding has been increased. A higher tax would have a still greater effect in this direction. It is indisputable that since its inception there has been a continual process of cutting up gardens, concentration of buildings, and increase of slum areas. The rapid increase of land value has undoubtedly largely contributed to this result. But it seems equally clear that the new system of rating has been a contributing factor. This was clearly foreseen by the present Chief Justice (Sir Robert Stout), who led the opposition to the bill in Parliament. He predicted that the effect of the bill would be to do away with the vacant spaces—with the lungs of the cities. He emphatically declared that, while in other lands reformers were struggling to get open spaces, this proposed

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legislation would lead in exactly the opposite direction in New Zealand.

3. The prosperity of New Zealand is chiefly due to the natural resources of the country, as yet only partially developed, and to the high prices for mutton, wool, and dairy produce that have prevailed during the past ten years. The effects of the land legislation have therefore been obscured. The policy of the government in encouraging closer settlement has doubtless contributed to the development of the country, but the rating on unimproved value has probably had little, if any, effect in promoting or retarding general or local prosperity.

4. The increase of buildings and other improvements has been due chiefly, if not altogether, to the general prosperity of the country, and the consequent increase of population. Districts where the old system of rating has been retained have prospered as much as the others. From 1901 to 1906 the population of New Zealand, exclusive of Maoris, increased by 15 per cent. The cities of Wellington and Christchurch, where rating on unimproved value is in force, increased by 25 per cent and 18 per cent respectively, while the city of Auckland, which has kept to the old system, increased by 22 per cent. Two of the suburbs of Auckland, Devonport, and Grey Lynn, under the new rating, have increased by 35 and 43 per cent respectively, yet the more conservative suburbs of Remuera, Mount Albert, and Epsom show gains of 42, 75, and 112 per cent. Karori and Onslow, suburbs of Wellington, which adopted rating on unimproved value in 1898 and 1901, have increased by 42 and 82 per cent, while the suburban boroughs of Petone and Miramar, which did not adopt the new rating until 1905, have increased by 56 and 95 per cent. The borough of Invercargill, which adopted the Act in 1901, has increased by 16 per cent, and the borough of Invercargill South, under the old rating, has increased by 22 per cent. The boroughs of Waimate and Hamilton, where the new system has been in force since 1901, have increased by 20 and 75 per cent, yet the boroughs of Timaru and Gisborne, with the old rating in force, show gains of 18 and 108 per cent. The total population of the 21 boroughs which adopted the Act before 1904 shows an increase of 24 per cent,

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while the total population of all the boroughs in New Zealand has increased by 22 per cent. The total population of the 10 counties where the Act was adopted before 1904 has increased by 10 per cent, and the total county population of New Zealand has also increased 10 per cent in the same time. So there is no evidence to show that the rating on unimproved value has either advanced or retarded the growth of the districts in which it has been adopted.[1]

5. The tax is not sufficient to stimulate building to any marked extent, but if it were, and a large number of people improved their land for the sake of securing some revenue, and not in response to increased demand, rents in general would fall, and the owners of improved property would lose as much as they had gained by exemption from taxation, or more. At the same time the propertyless class would gain by the reduction of rents.

6. The question of equity in the majority of cases has transformed itself into a question of the interests of the several classes concerned. There are two classes of owners: those whose unimproved value is much greater than the value of their improvements, and those who own a relatively greater value in improvements. Owners of the latter class are well satisfied with the rating on unimproved value, since it has reduced their taxes. Owners of the former class complain when their taxes are materially increased, but since land values have risen almost everywhere, most of these people have lost nothing and feel no great burden unless they are holding large quantities of unimproved land. There are many individual cases of hardship, as where a poor person in a borough has a large vegetable garden or a paddock for a cow. Some industries, too, such as lumberyards, foundries, and dairies, situated within a borough, have had their taxes greatly increased, and have been compelled to move to the country, where land is cheap. Not infrequently people owning large houses built upon small lots have had their taxes reduced, while some of their poorer neighbors have paid more. As a rule, however, a large house is built upon a large piece of land and a small house upon a small allotment. Moreover, rich people as a rule own more unimproved land than poor people. Therefore

[1] Census of 1906.

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the adoption of the new system involves a shifting of the burden of local taxation from the many to the relatively few, and those few, in a progressive community, are usually those best able to bear it. In a stationary or declining community the case might be quite different.

Where the system has been adopted in counties containing towns, the taxes on rural property are relatively increased and those of town property relatively decreased; so that the country people complain and demand a system of differential rating, or a separation of the towns from the rural districts for purposes of rating. Again, in rural districts the rates fall more heavily upon the holdings of new settlers than upon the improved holdings of their more prosperous neighbors.

7. Land values have risen greatly, notwithstanding the tax. This, together with the slight amount of the tax, is probably the cause of the general indifference of ratepayers to the question. There is still a great deal of speculation in land, and land values are probably too high, in view of a possible and even probable fall in prices of mutton and wool because of increasing competition on the part of Australia and Argentina.

8. Many of the ratepayers, if not a majority, have had their rates reduced and are well satisfied with this result. Many others are indifferent. The working class, who are interested in the securing of lower rents, are largely in favor of rating on unimproved values, but only those who own property can vote on the question. Town clerks are inclined to favor the system because, if adopted for all rates, it would permit of a simplified system of bookkeeping. The minority who suffer hardship do not seem to have sufficient influence to have the system abolished.

The case of North-east Valley is of particular interest since it is the only district that has adopted the system and afterward abandoned it. The borough has a population of 4,467. It adopted rating on unimproved values on January 12, 1905, and voted for rescission on March 30, 1908. In reply to the government's circular, the borough reported as follows: "Decreases rates on buildings. Increases rates payable on land. Encourages building operations. Attracts population. Does not materially

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reduce rents. Oppresses holders of land unsuitable for building. Discourages land speculations. Reduces number of vacant sites." In reply to the writers' circular the answers were, in brief: "Discourages speculation in land. Forces people to sell private gardens and other land. Has increased prosperity, causing a large increase of building and influx of population. Has not unduly stimulated building, but there is danger of this. Is hard on the farmer. Differential rating should be allowed. It has made land cheaper and easier to get. The majority are eased and therefore satisfied. The minority feel the additional burden."

A number of people in New Zealand, particularly the followers of Henry George, give a glowing account of the success of rating on unimproved values wherever tried. The Hon. George Fowlds, Minister of Education, holds that the land taxes, both general and local, have been among the chief causes of the prosperity of the Dominion during the past ten or twelve years. Mr. Ell, M. H. R., is strongly in favor of the new system, and would have water rates, gas rates, and all other rates, general and special, levied upon the unimproved value. Mr. George Laurenson, M. H. R., said in the House: "I can assure you that the rating on unimproved values system will yet be adopted by every municipality in New Zealand. In the next ten years it will be adopted in connection with every class of rates that may be levied in this Colony."

But the facts do not seem to warrant optimistic conclusions such as these. The benefits of rating on unimproved values are not so obvious as to command unanimous approval or to persuade all the rating districts to adopt it without delay. The opposition to the system appears to be growing stronger as people are coming to recognize its relation to the propaganda for single-tax. The small landowners like to shift the burden of taxation from their own shoulders to those of their wealthy neighbors, but they are strong supporters of freehold tenure and will not readily consent to have their property confiscated by any radical extension of the principle of taxation of unimproved values.

The growing political power of the laboring class, for whose benefit much of the recent legislation of New Zealand has been

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enacted, may ultimately bring about the nationalization of land, but surely not until the Dominion has become an industrial nation, rather than a pastoral and agricultural community as it is today. Up to the present time the effects of rating on unimproved values have been insignificant. The most notable feature of the system is the shifting of the burden of local taxation from one class of taxpayers to another. It is an interesting phase of the tendency which prevails throughout Australasia toward an equalization of wealth by means of a legal transfer of the property of the wealthier classes to the pockets of their poorer neighbors. How far this process will go it is impossible to foretell, but that its ultimate results will be beneficial to the majority of the people is by no means certain.

Viewing the New Zealand system of taxation as a whole, it is seen to be more like European than American systems in that it derives large revenues from income taxes and stamp duties, sources generally neglected in the United States, except in time of war. No doubt the New Zealand system is well adapted to the conditions of the country, and the only serious criticism that could be made is that too much is taken from the taxpayers and too little returned to the people in the form of social benefits. That the taxpayers' burdens will be reduced does not seem at all likely, but that economy in expenditure will increase the sum total of social benefit may at least be hoped.

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THREE LONDON THEATRES OF SHAKESPEARE'S TIME.

By Charles William Wallace.

I

NATURE OF THE NEW DOCUMENTS.

The records presented in the following pages came into my hands in the natural course of research conducted in European archives by myself and wife the past few years, resulting in a series of similar discoveries on the stage and drama of Shakespeare's time. They belong to the Court of Requests, of the reign of James I, and are preserved in the Public Record Office at London, the great national archives of England, where are admirably kept the most varied and extensive sources of history in existence.

The pleadings of this branch of equity for the period in hand are uncalendered, or unindexed, and have lain unexamined for three hundred years. They were prepared by the officials for inspection upon my request. Skins, or parchments, ranging from twelve or fifteen square feet to occasional scraps an inch wide, compose the chief bulk of the proceedings. Most of them are as large as a sheep-skin would cut to straight edges, and the finely written lines run the entire width of the skin. Depositions, re-

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ports, &c., are on heavy hand-made paper. All, except the miscellaneous books, have long been well and cleanly preserved in great canvas-covered bundles nearly three feet square. When they were prepared for my examination, the fine old bundles, because of the difficulty experienced by the office in handling their great bulk and weight, were broken up into two or three parts each. Some of the documents are mouldered, rotted away in places, or matted together from damp and parasitic diseases peculiar to archives, while others are not only as perfect as the day they were written, but have acquired that additional beauty which comes only from the tone of time. The condition of the present collection is sufficiently indicated below.

It is often thought that the finding of valuable materials in such masses is a mere matter of chance or "luck." The preposterousness of such a notion would be demonstrated at once to any one who should attempt research upon such a basis of mere haphazard. Out of the hundreds of archives, you must, upon sure information, determine whether you will search in the one or the other, and in following out a system, you will find yourself led, as I have been, first into one, then another, and another. Once in, you must know what class of documents to search. For example, at the Public Record Office alone, there are some thousand classes and sub-classes of documents. The same conditions, on a smaller scale, exist in the other archives. Out of all these you must, by some definite information or clue, determine in what class the records lie that will give the information you desire. A chance result may, of course, come to any one, just as has been the case in this very field. But chance cannot be depended upon. A continued series of results is achieved, not reached by a hand thrust at random into the dark.

In my own researches, neither the present discoveries nor any others have been the result of accident, or chance, or "luck." They have come from severer, surer methods. I was led into this particular class of records, just as I have been led into all others, in following out definite clues in a rigorously scientific and systematic course of research. It is comparatively easy to examine any class of records after you know where and what

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that class is, and what to hunt for. But one might search a life-time, as many illustrious men, some of them my predecessors, have done, without finding any of these. It looks all very simple after it is done. And it is simple,—after it is done, —as illustrated by the famous story of standing an egg on end.

I may add that we have examined every document preserved in the Court of Requests for the period in hand, and are able to report that the following are the only records that still exist there in the cases of Woodford *vs.* Holland, Smith *vs.* Beeston, and Alleyn *vs.* Henslowe.

The contemporary records now presented reedify three old London theatres of Shakespeare's time, revivify their owners and actors, and make us see and realize and share in the existence of each, as if we were of and in and properly belonging to that long past that was just as real and just as human as our own present. These old theatres were not things of romantic wonder, nor were the actors glorified beings that trod the boards with god-like movement and divine passion. Both were as real and as common as life and its means of existence. Partly from their contemporaneousness with Shakespeare and partly for their own sakes in a revered past, the dramas that first spoke to the little audiences from the lips of these actors, and from the stages of these theatres, and through the financial risks of these shareholders and managers, have come down to us with so much of idealization and so little of these living voices that we have long been wont to think romantically, rather than really, about them. But it is good to walk among living men, to meet them, talk with them, know and feel their lives, careless of what may come of it, but sure in the end that such good is best. If these documents did that only, then they would be well worth reading. But they inform, as well as bring us to a proper mental attitude.

In presenting the new information I have not followed the severe scientific methods of my own models and ideals, because these records are but fragments of large history, and I desire here mainly to put the matter into print for future reference of both myself and others who may engage in the scholar's task and privilege of editing data into truth. I do not feel,

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however, that a mere report would be either adequate to the materials or just to the student of literary history. Both scientific accuracy and faithfulness to matter and reader justify and require the printing of these documents *in extenso,* even though they be verbose and prolix. The writers of them, three centuries ago, did not have an eye to our present day ignorance of or unfamiliarity with or injudicial criticism concerning their forms of expression, methods of spelling, punctuation, &c. In being faithful, therefore, to the documents in word and letter, so far as the present printer's facilities allow, I am doing neither more nor less than honest dealing with them demands.

In this sort of work the ideal for the scholar is the original document itself. The next approach to it is the photographic facsimile. Next to that is the type-facsimile, with all signs of contraction presented. It is falling somewhat short of my ideal to have none of these. But since the signs of contraction would require to be specially cast for this matter, I follow the next best method, by expanding into italics all signs of contraction, and making a type-facsimile of all else. When no sign of contraction is found in the original, the shortened form is not here expanded. There is, therefore, in these expansions no "method" or "system" or "uniformity," such as only the unscholastic could wish, but a rigid adherence to the documents themselves, such as every scholar has a right to demand. You will find, for example, such as "pl", "plt", "plᵗ", and pl*aintiff,* all for the same thing, because only in this last form does the original have a stroke above or through the short form which the present fonts are not provided with. If faithfulness of representation alone did not demand keeping these ununiformities, they should still be retained for the very flavor of antiquity they give. If such forms and the irregular spellings, with capitals and punctuation distributed at random, seem to some no more than merely "quaint," their effect will not have been wholly lost.

Superior letters are kept, long "ſ" is represented by modern short "s", and signs of contraction, as above, are expanded into italics. Otherwise the print aims to be faithful to the original. Words in square brackets [thus] are not in the documents,

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but are inserted by me. Such insertions at the head of the documents merely explain. Those in the body indicate illegibility, from decay, and are supplied either from the context or from some other record of the series.

This matter has gone through the press during my absence from the University. But as the proof-reading has been done under the direction and care of the editor and the committee of the *Studies,* it is hoped that it will be found to be accurate.

II

THE RED BULL THEATRE.

To J. P. Collier, despite his colossal forgeries, we owe great credit for new knowledge and the assembling of old information on the theatre and drama of the period best designated as Shakespearean. His knowledge of the Red Bull was slight, but it was more than had been found out prior to his first publication in 1831. He did not know the date of its erection, but inferred it to be late Elizabeth. He ascertained that it was located at the upper end of St. John street, but erred in supposing it originally an inn yard, like the Bell Savage of Ludgate Hill. He found that it was occupied at some undetermined time in the reign of James I by Queen Anne's men, and then, after her death, March 2, 1618–[19], by some of the same actors under a new name, the Revels company; that it was, as mentioned in Prynn's *Histriomastix,* in 1633 one of the "two old playhouses" and had been "lately reedified and enlarged"; that, under the regime of the Puritans of the Commonwealth, it was, for example in 1647, used clandestinely by once famous actors in play presentations; that it was, after 1660, under the Restoration, used by Thomas Killigrew's royally licensed company; and that before 1663 it was tenanted only by fencers and spiders.

We have, since Collier's day, added to this information. A picture from Kirkman's *Drolls* (1672), certainly much older than its date indicates, shows crudely a portion of the interior and the arrangement of the stage. While this gives us information of a kind, it is of doubtful value in its customary applica-

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tion to any theatre of Shakespeare's time. Among the Patent Rolls at the Public Record Office (7 James I, part 39), is a patent of 15 April, 1609, granted by King James to ten actors, servants to the Queen, then acting at the Red Bull and the Curtain. This was first printed by T. E. Tomlins in *The Shakespeare Society's Papers,* 1847. Dr. F. J. Furnivall published in *The New Shakespeare Society Transactions* (1877–1879) certain extracts from the Lord Chamberlain's accounts, preserved in the Public Record Office, showing the amount of red cloth granted for the King's Procession through London at his coronation in 1604, to William Shakespeare and his associates at the Globe, who were known as the King's Men, to the Prince's actors at the Fortune, and to the Queen's men, who then or soon after occupied the Red Bull. We know also some of the plays acted there, and the names of the chief actors throughout the reign of James I.

In 1885 Mr. James Greenstreet, who, for many years during his genealogical researches at the Public Record Office and elsewhere, was employed by Mr. J. O. Halliwell-Phillipps to report to him any documents bearing on Shakespeare or the stage, chanced upon a number of valuable records. Among these was a Chancery suit between members of the Red Bull company, the will of Thomas Green, and three of the minor documents, of easy access, in the Woodford-Holland series presented entire in the following pages. He published his discoveries in *New Shakespeare Society Transactions* and *The Athenaeum,* as also separately, in 1885. All of them are reprinted in F. G. Fleay, *A Chronicle History of the London Stage* (1890).

Thomas Green's will, when isolated, furnishes little information about the Red Bull. But it is of some service when correlated with other matters. The Woodford-Holland order of May 15, 1613, the decree of June 23 following, and the affidavit of July 6, the three which Greenstreet found, fall into proper place in the following new series, so far as the great gaps and losses allow. They are also now printed for the first time accurately. The Chancery suit of May, 1623, yields invaluable information on the management of the company. But as that

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suit comes at a later date than the Woodford-Holland and the Smith-Beeston suits here presented, and as I hope later to publish other documents that supplement the Chancery suit, I shall not here deal with its materials.

The following sets of documents increase our information. In spite of their repetitions and verbosity, they furnish us more information about the organization, management, and dissolution of the Red Bull company than all previous documents, except the Chancery suit, and besides throw out valuable new hints as to the methods prevalent in other theatres of the Shakespearean period. I desire here merely to call attention to salient points of interest, reserving for volumes already announced the privilege of adequate correlated presentation and analysis of the history involved.

The Woodford-Holland documents present an anomalous condition. Time has played many pranks with ancient records, and we may well be glad that he has not finished with these as he has with so many. In our long search through some million of records, and indexed names in multiplied number, we have again and again traced a document to its lair, only to find it no longer existed. It is our experience in some classes of documents that nearly all are extant, and in others, of high historical importance, that only about one document in ten or twelve is now preserved. The rest have perished. Sometimes an entire class of documents is gone. The records are well cared for now; but when you see the moulded, rotten, or massed condition of some of them, the result of damp or even neglect in past centuries, you marvel at the perfect preservation and even beauty of others side by side with them, and are thankful for the information they yield in any form, whether whole or fragmentary. The anomaly of the Woodford-Holland records is, that we have left from the ravages of Time and his assistants a complete set of the court's proceedings in a case begun in 1613, but none of the pleadings; and in 1620–21 a complete set of pleadings in practically the same case renewed, but not a single scrap of evidence of the court's proceedings. No witnesses were examined for either Woodford or Holland in the suit of 1620–21, as shown

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by the perfect lists of witnesses, term by term, kept in the court's witness-books. A commission was issued to Dyott and Goldsmith to examine witnesses in the 1613 suit, but Goldsmith's report indicates they examined no witnesses, but instead called the plaintiff and defendant together in his office and arrived at a basis of settlement.

The matter in controversy is easy enough to follow. But some of the most valuable points of history are only incidental to the suits, and are elusive. They must be supplied from other sources.

It appears there was some sort of building known as the Red Bull in St. James, Clerkenwell, prior to the theatre that was built on the same place. It was owned by Christopher (?) Beddingfield, whose wife and administratrix, after his death, leased it to Aaron Holland. Holland, at some unknown date before 1605, built the Red Bull theatre there, and leased it out. The date of erection, as shown under the Smith-Beeston documents, must have been between 1603 and 1605.

Following the example set by Shakespeare and his associates in dividing the Globe into shares, as presented in the now famous Osteler-Hemynges documents which I made public in the London *Times,* Oct. 2 and 4, 1909, the Red Bull likewise was divided into shares. It was evidently leased to Queen Anne's company in or before 1605; for Thomas Swynnerton, a lessee of one share or seventh part in that year, with the official position of gatherer—the box-office man of that day—was a member of her company.

About three years later, Swynnerton sold his share or one-seventh part to Philip Stone, who, like Holland, was too ignorant to read or write. A new lease, or indenture, dated in February, 1608, was made accordingly by Holland to Stone, presumably on the same terms as formerly to Swynnerton. In 1612, about the time of Thomas Green's death, when the company underwent several changes, Stone, needing money, sold out to Thomas Woodford, a man little known to historians of the stage, but connected, I find, with nearly every theatre in London. He was a merchant, and traded extensively in continental Europe.

The consideration from Stone to Swynnerton and in turn from Woodford to Stone was 50 *l.* outright for the one-seventh part

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of the profits, and 50 *s.* yearly for one-seventh of the rent of the theatre of the Red Bull. Woodford claims that the profits on one share or seventh part amounted yearly to about 30 *l.* Approximately three months after his purchase, Woodford went beyond the seas, and left the business of the Red Bull in the hands of his agent, Anthony Paine, and Holland. During his absence, Paine, he says, failed once to pay the rent on the day it was due, whereupon Holland claimed forfeiture of the share. So, when Woodford a few months later, in 1613, returned, failing to agree with Holland in an equitable settlement, he brought suit against him in the Court of Requests. He asks full restitution of his share, as well as the position of gatherer attached to it, and the profits, which he estimates at about 30 *l.* yearly.

The documents themselves best tell the long, hard fight in different suits and courts for a period of nine years to establish what Woodford believed to be his rights. In the main, the Court of Requests sustained Woodford, and the Kings Bench overruled both him and the Court of Requests. Had it not been for the bitter feeling of these two courts toward each other, this case and many another would have been settled shortly. To a student of the English judicature in one of its most visible and rapid periods of evolution, with Sir Edward Coke on one side and Sir Julius Caesar on the other, this case is highly instructive merely from the legal point of view. But the Smith-Beeston case is illuminating in showing how even the parties summoned were affected by the war of the courts in their contempt for the judicial authority of the Court of Requests. I shall later present another in which the contempt becomes comical.

The market value of a share in the Red Bull and its profits furnishes a new basis for estimating the incomes of theatrical shareholders. The Osteler-Hemynges documents, just referred to, estimate the annual profits of one-fourteenth of the Globe at 300 *l.*, and one-seventh of the Blackfriars at 300 *l.* But I have previously pointed out that this is an excessive estimate and cannot be taken as a proper basis. I am publishing still other documents which show a very conservative and quite accurate estimate of the profits in the Globe. As I deal there with the present

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estimate as well as others now available, I need not re-present the matter here. It is sufficient now to note that on the basis furnished by the present documents, the cash value of the Red Bull shares was 350 *l.* as a profit-producing concern, its annual rental value was 17 *l.* 10 *s.*, and its net profits, 210 *l.* yearly.

In the 1613 suit, the most important point, for us, concerns "the gatherer's place," the pay for which at the Red Bull was on a percentage of 5⅝ % of the total receipts at each play; or, as here put, the eighteenth part of every penny. On this point there is a palpable error in commissioner Goldsmith's report, 22 June, 1613. It is clear that the actual basis of settlement was, not as Goldsmith by hasty error puts it, but, first, that Holland should yield a point and re-grant to Woodford the share or one-seventh part formerly held in succession by Swynnerton, Stone, and him; and second, that Woodford should, in turn, yield up to Holland the gatherer's place and its profits of one penny out of every eighteen collected or received. Goldsmith has simply confused the share in the theatre and the perquisites of the gatherer in his first two articles.

We have long known that the contemporary theatres had "gatherers." But this is the first hint of either the amount or method of pay in any one of them.

The Woodford-Holland documents, with their gaps and interruptions, are here presented in chronological order.

WOODFORD VS. HOLLAND.

Court of Requests Proceedings, Uncalendered, James I. [1613.]

BILL AND ANSWER.

[Not extant. Date, probably Hilary, 1613, or possibly Easter.]

Decrees and Orders, Easter Term, 11 James I, Vol. 26, p. 730.

10° Maij a° 11° et 46°./

Towching the cause at the sute of Tho: Woodford compl^{t} againste Aaron Holland def^{t}, vpon the mocion of Mr Dyot of counsaill wth the said compl^{t} yt is ordered that the said def^{t} having convenient

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notice of this order shall at his perill attend this court, vpon friday next to shewe cause why a decree should not be made to put the pl^t^ in present possession of the profittes of that part of the play howse called the redd Bull in question, whereof the pl^t^ had A lease, and why he should not make vnto the said compl^t^ A newe lease according to the former lease, made of that part of the saide howse to one Tho: Swynerton, wch lease by meane assignement came to thandes of the compl^t^, & also to shewe cause why he the said def^t^ should not be accomptable for such moneys as he hath receaued for the pl^t^, & why also the arrerages of eighteen pence A weeke due to the gatherers place, & deteyned by the saide def^t^ should not be referred to some indifferent men texamine & certifie.//

[A transcript of this order, dated 11 May, 11 James I, evidently served by the Messenger of the Chamber on the defendant, is found also in one of the bundles of the uncalendered records of the Court of Requests.]

Decrees and Orders, Easter Term, 11 James I, Vol. 26, p. 780.

xv^to^ die Maij A° R Regis Jacobi Anglie
ffr: et Hibernie 11° et Scotie 46°./

Woodford Holland

In the matter of varyaunce depending before his ma^tie^ & his highenes Counsaill in his ho: Court of Whitehall at the sute of Thomas Woodford gent compl^t^ against Aaron Holland def^t^, Being amongest other thinges for & concerning the compl^tes^ demaund of the eighteenth penny and the eighteenth part of such moneys & other comodities as should bee collected or receaued for certen yeares yet enduring for the profittes of the Galleries or other places in or belonging to the Play howse called the Red Bull at the vpper end of St Johns streete London, as in & by the said compl^tes^ bill of complaint is declared, Vnto wch Bill the said def^t^ hath made answere, Wherevpon it is now Ordered by his ma^tes^ said Counsaill by & wth the consent of both the said parties that the said matters of the compl^tes^ bill, & the def^tes^ answere shalbe wholly & absolutely referred to the hearing and ordering of Anthony Dyot & Clement Gouldsmithes esq^r^ Counsailo^rs^ at lawe being seuerally of counsaill wth the said parties, who are

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content to take paines for the composing of the same controu*er*sies, ffor wch purpose A Com*mission* vnder his highenes Privie Seale shalbe directed vnto the said m^{r} Dyot & m^{r} Goldsmith, aucthorising them thereby to call before them both the said p*ar*ties, together wth all such witnesses as by either p*ar*tie shalbe no*min*ated And to examine them the said witnesses by theire othes in due forme of lawe, vpon such articles Jnterr as by either p*ar*tie ministred towching the matters of the said bill & answere, And by all such good wayes & meanes as to them shall seeme meete to searche & fynde out the veritie of the p*re*misses, And therevpon finally to Order & determine the same controu*er*sie if they can, But if they cannot so doe Then to certify theire wholl doing*es* and p*ro*ceeding*es* therein into this court on the Quindezim of tholy Trinitie next cominge, Wherevpon his ma^{tes} said Counsaill are pleased to take vpon them the vmp*er*age of the same matters, & finally to determine the same—/

Decrees and Orders, Trinity Term, 11 James I, Vol. 26, p. 835.

xv^{to} die Junij A° RR*egis* Jacobi Anglie
ffr: et Hib*er*nie xj° et Scotie 46°./

Woodford / Holland Towching the cause at the sute of Thom*as* Woodford compl^{t} against Aaron Holland def^{t} vpon opening thereof in p*rese*nce of Counsaill on both sydes it is ordered that the said def^{t} having convenient notice of this order shall at his p*er*ill attend in p*er*son in this court vpon monday next (seden*te* Cur*ia*) to shewe cause why he should not make A sufficient lease to the compl^{t} according to the certificat or report of Anthony Dyot esq^{r} A form*er* Commissione*r* in this cause, And also why the profett*es* of the xviijth p*ar*t of the play howse in question should not be sequestred into thand*es* of A third p*er*son indifferent, to be p*re*served vntill the said lease be made.//

Commissioners' Report. Found among the uncalendered Proceedings.

Accordinge to a Com*m*ission vnder his Mat^{ies} Privie seale to Mr Anthonie Dyett of the Inner Temple Esquio^{r}, and my selfe

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directed from his Ma^tie^s Courte of Requestes and the Councell thereof to here and determine of the cause in Controu*er*sie depending*e* in the said Courte betweene Thomas Woodford p:^lt^ and Aron Holland defend^t^. touching*e* an interest claymed by the p:^lte^ bill in the 18:^tinth^ parte of the p*ro*fitt*es* of the plaiehouse called the Redd Bull in the p*ar*ishe of St James at Clarkenwell. Wee, in whitsune weeke last, did meete at 2 seu*er*all tymes at my chamber in Grayes Inne callinge both the p*ar*ties before vs, and heard all Allegac*i*ons on both p*ar*tes, and p*er*vsed the Indentures made by the defend.^t^ vnto Stone and the Coven*an*t*es* therein, and in the end wee both as I then conceaved did agree and assented vnto these 4 Articles and thing*es* to be p*er*formed by the said p*ar*ties viz://

iffirst that a newe graunte should be forthw^th^ made by the defen.^t^ vnto the p:^lt^ of the 18.^tinth^ p*ar*te of the p*ro*fitt*es* of the said plaie house, for the Remainder of yeares yett to come in the graunte made to the said Mr Stone, whose interest the said p.^lt^ claymed wth the like Coven*an*t*es* and Condicons as were before in Swinnerton or Stones graunte/.

2 Secondlie that the defend.^t^ should enioye the gatherers place then in question betweene theme and not the p:^lt^/.

3 Thirdlie that Mr Holland should be discharged as against the p.^lt^ for the meane p*ro*fitt*es* that he hath receaved since the forfeiture in regard that the gatherers place had heretofore beene detained and kept from him by the p.^lt^ and those from whome he claymeth his interest./

4. Lastlie that in Consideraci*o*n of this newe graunte, the p.^lt^ should paie vnto the defend.^t^ vj.^li^ xiij^s^ iiij.^d^ and be discharged of the halfe yeares rente due at our ladie daye last past wch came to 25:^s^ With this Agreement we acquainted both p*ar*ties whoe then seemed vnto vs as we then conceaved to be well pleased wth the same/.

This at the request of the defend.^t^ I am bould to Certifye vnto this Hono*ur*able Courte, the rather for that the said p.^lt^ hath p*ro*cured a single Certificate from the said Mr Dyett, never makeinge me acquainted wth the same leavinge neverthelesse the

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cause to the further grave and Iudicious Censure and consideracion of this Honorable Courte/

Cle:t Goldsmyth
22 die Junij *1613*.

Decrees and Orders, 11 James I, Vol. 26, p. 890. [Document badly damaged.]

xxiij° die Junij A° &c 11° et 46°./

Woodford Holland In the matter of varyaunce depending before his matie, and his highenes Counsaill in his ho: Court of Whitehall at the sute of Thomas Woodford gent compl^t against A[aron] Holland def^t, Being amongest other thinges for & concerning the compl^tes [d]emaund of the eighteenth penny and eighteenth part of such moneys and other comodities as should be collected or receaued for certen yeares yet enduring for the profittes of the Galleryes or other places in or belonging to the Play howse called the red Bull at the vpper end of St Johns streete London according to A deede Jndented made & sealed by the said def^t vnto Phillip Stone gent his executo^rs administrato^rs & assignes and certen covenauntes therein for the consideracions & vnder the yearely rent of fiftie shillinges quarterly to be payed by [eve]n porcions in such manner as in the bill is expressed, wth proviso that [in de]fault of payment of the said annuall payment at the dayes for [paym]ent thereof, the benefit & comoditie graunted as aforesaid together [with] the said Jndenture should cease, Which said Phillip Stone hath [graunted] and assigned over by good conveyaunce in writing his state and [inter]est in the premisses vnto the compl^t and his assignes, And the compl^t [entrusted] the said Holland wth receipt of the profittes thereof to the [use of the compl^t] who promised to deale well wth him in his absence beyond [the seas] And that he would not take advantage of the breache of anie [covenant that mig]ht happen in the time of his absence (if any such shoulde . . . [happen]) Neuertheles the said compl^t did take speciall order with [one An]thony Payne that he should performe the sayd yearely paymentes [of fift]ie shillinges at the dayes wherein the same moneys should growe [due] who neglect-

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ing one quarters payment being xij^{s} vj^{d} for the space [about] of one day or two the said def^{t} afterwar*des* refused to accept of the [sam]e and seeketh to take the benefit and advantage of forfeiture of [the] said Jndenture and refuseth to accompt wth the compl^{t} for the profitt*es* [recei]ued by him wherein the compl^{t} prayeth releife as in his bill of [comp]laynt is declared. Vnto wch Bill the said def^{t} by way of [ans]were amongeste other thing*es* hath sett furth that if the said compl^{t} [sh]all satisfie and pay all such som*mes* of money as he the compl^{t} or anie other from whom he claymes haue vniustly deteyned or caused to be deteyned from him, he is well contented to make A newe Jndenture vnto the compl^{t} in his owne name, vnder such coven*auntes* articles provisoes condic*i*ons & agreement*es* as are conteined in the said Jndenture form*er*ly made by him to the said Phillip Stone, As by his said answere may appear, Vpon opening of which matter before his ma^{tes} said Counsaill in p*rese*nce of the counsaill learned of both the said p*ar*ties, and vpon consideraci*o*n had of the said def^{tes} said answere & other circumstances of the cause, And for that the said def^{t} hath not made apparant to this Court what moneys are iustly due vnto him from the said compl^{t}, Jt is therefore Ordered by his ma^{tes} said Counsaill that the said compl^{t} his executo^{rs} & administrato^{rs} shall fromhencefurth haue and receaue the profitt*es* and benefitt of all the said p*re*misses in as lardge and ample manner, and in such manner & forme as he or the said Phillip Stone before him or any other p*er*son for or on the behalf of the said comp[l^{t}] or of the said Phillip Stone ever heretofore had and enioyed the same without the lett denyall disturbau*n*ce or contradicc*i*on of the said def^{t} or any other p*er*son or p*er*sons clayming in by from or vnder him, vntill such tyme as other and further order shalbe in this court taken and made to the contrary And it is further ordered that the said compl^{t} s[hall] and may [dr]awe A newe Jndenture or deede Jndented to theffect of the form*er* wth such coven*auntes* & p*ro*visoes as in the form*er* Jndenture graunted to the saide Phillip Stone is conteyned wch the said def^{t} shall furthwth vpon request in that behalf to be made seale & deliu*er* as his deede and

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exe[cu]te the same to all intent*es* and purposes as the said form*er* Jndenture [w]as made and executed notwithstanding any p*re*tended forfeyture there[of] And for the other demaund*es* aswell of the compl^{t} as def^{t} the said p*ar*[ties are given] lib*er*tie to p*ro*ceede according to the ordinary course [o]f this Co[urt. And] yt is lastly ordered that an Jniunccion vnder his ma^{tes} Pri[vie Seale] vpon paine of CCC^{l} shalbe directed to the said def^{t} and [euery and all other] p*er*son or p*er*sons clayming in by from or vnder him to whom [in this case] it shall app*er*teine, for the due p*er*formaun*ce* of the p*re*sent ord[er] . . . . .//

Process Book, Trinity Term, 11 James I, vol. 183, fol. 377.

Tertio die Julij

An Jniunccon to Aron Holland and others to p*er*forme An order at the suite of Tho: Woodforde gent . . . . . .

Process Book, Trinity Term, 11 James I, vol. 183, fol. 378, dorso.

Quinto die Julij/

An Attacht to the Sheriff*es* of London middl*esex* and ffleete to Attache Aaron Holland at the suite of Tho: Woodforde . . . . . } xv° mich*aelis*

Affidavit Book (Draft), 9–13 James I, Miscellaneous Books, 128.

6° Julij. 1613

Jnr Towching the cause at the sute of Tho: Woodford gent compl^{t} against Aron Holland def^{t}: Iohn Penkethman of the p*ar*ishe of St Dunstans in the West Scrivener maketh othe, that vpon the fyvth day of this instant moneth & also vpon this p*re*sent day, he served his ma^{tes} writt of Iniunccion vnder his highenes P. S. vpon the said def^{t} for p*er*formance of an order made in this court betwen the said p*ar*ties dated the xxiijth of Iune last & this depon^{t} yesterday did offer to reade the order & Iniun*ccion* vnto him wch he refused to hear but the def^{tes} sollicito^{r} this

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p*re*sent day did reade them both, & tolde the def^{t} the effect thereof, And this depon^{t} & also the said compl^{t} did tender to the saide def^{t} an Jndenture drawne & engrossed according to the said order wth wax ready put therevnto requiring the def^{t} to seale the same, but he refused so to doe

Joh: Pen^{keth}man

Court of Requests Proceedings, Uncalendered, James I. [*1620.*]

WOODFORD'S BILL.

[Upper left and right portions of Bill decayed, and small parts gone. A few words illegible, and the entire Bill difficult to read. Often the ink is gone, and only its impress in the parchment remains, which can still be read with the aid of good light and a magnifying glass.]

[Date of filing, *in dorso,*] xxxj die [Martij] Anno R Regis Iacobi Anglie ffranc et hib*er*ne xvij° et Scotie lij^{do}./
Vocetur defend p*er* nuntiu*m* Camere./

To the King*es* most
Excellent Ma:^{tie}

[Humblie] Complayninge sheweth vnto yor most excellent Ma:^{tie} yor humble and faythfull Subiecte and Complain^{t} Thomas Woodford of Southwarke in the countie of Surry gentleman that wheras one Aron Holland of the parish [of St James] Clerkenwell in the Countie of Midd*lesex* yoman was lawfullie possessed of and in one messuage or tenemente with thapp*ur*tena*un*ces [Com]onlie called and knowne by the name of the Redd Bull scituate in the parish of S^{t} [James] Clerkenwell aforesaid by force of a lease therof for manie yeares yet induringe to him therof made by Anne Beddingfeild late wyeffe and administratrix of the good*es* and Chattell*es* of Cristofer(?) Beddingfeild deceased and he the said Aron [soe being]e therof possessed did afterward*es* erecte builde and sett vpp in and vpon some parte of the same messuage or tenement diu*er*s and sundry building*es* and galler[ies wch he afterwardes] leased for a playhouse [for acting] and [settinge] forthe of playes comedies and traged[ies] or to doe other exercises at and in the same. After wch he the same Aron Holland soe beinge possessed as aforesaid

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of all the same premises wth their ap[purtenances] did by his Indenture of lease [bearinge date the . . . day of . . .] in the third yeare of [the] reigne of yor Matie over this yor highnes Realme of England made betwene the said Aron Holland of the one p*ar*tie and Thomas Swynnerton of the other p*ar*tie demise and graunt a seaventh p*ar*te of the said playhowse and gallaries with a gatherers place there[to] belonginge or app*er*teyninge vnto the said Thomas Swynnerton for dyvers yeares then and yet by efluction of tyme to come by force wherof he the said Thomas Swynnerton therunto [entered] and was therof possessed accordingly and he soe beinge therof possessed vpon communicacon and speech therein had betweene them the said Aron Holland and Thomas Swynnerton and one Philipp Stone of London gentleman it was concluded agreed and condiscended betwene them in manner and forme followinge vizt That the said Thomas Swynnerton should surrender and yeild vpp his said lease interest tytle and tearme of yeares in and to the premises vnto the said Aron Holland to the end intent and purpose That he should make such and the like lease for the same for soe manie yeares as weare then therein to come, vnto the said Phillipp Stone at the yearelie rent therein before reserved to be payed quarterlie by twelve shillinges and six pence at the foure vsuall tearmes Dayes and tymes in the yeare or within fourteene daies then next ensueinge everie of the said ffeastes and daies in consideracion of ffiftie powndes to be payed by the said Phillipp Stone vnto the said Thomas Swynnerton of wch ffiftie pownd*es* he the said Thomas Swynnerton should lend twentie pownd*es* to the said Aron Holland for a whole yeare gratis In consideracion wherof the said Aron Holland was to make the said lease to the said Phillipp Stone as aforesaid wch he did then or sone after accordingly But when the said newe lease was to be soe therof made renewed and graunted to the said Philipp Stone as is aforesaid he the said Aron Holland to defraude deceaue and abuse the said Phillipp Stone beinge a simple and ignorant man who reposed much trust confidence and creditt in the said Aron Holland, and to whome he did referr the renewinge and makeinge of the same newe lease in such sorte as the former was w^ch^

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was soe graunted vnto the said Thomas Swynnerton accordinge to the Counterparte therof wch then remayned wth the said Aron Holland he the said Aron Holland did alter and chaunge the same in dyvers and seau*er*all materiall pointes therof differinge from the said agreement and from the said former lease soe therof made vnto the said Thomas Swynnerton as is aforesaid to the greatt losse and p*rei*udice of the said Phillipp Stone and his assignes wch he then did not knowe nor was acquainted w^th^, And namelie in this That wheras the former was a lease and graunte the other later was made without anie lease or graunte at all but onelie bare and single Covenant*es* therein And sealed the same as an Jndenture of lease wch the said Phillipp Stone did verilie beleeve and creditt vpon the wordes affirmac*i*ons and solempe protestacon of the said Aron Holland he the said Aron Holland did scale and delyvere his acte and dede the one parte therof vnto the said Phillipp Stone as the same Phillipp Stone alsoe did the other parte therof vnto the said Aron Holland w^th^out any examinac*i*on or siftinge all of the truth W^ch^ said Jndenture beare date aboute ffebruarie Anno do*mi*ni 1608 and in the sixth yeare of yor Ma^tes^ happie raigne over yor highnes Realme of England. And afterward*es* that is to wytt aboute the tenth yeare of [yor] Ma^tes^ raigne of England the said Phillipp Stone then wantinge money and beinge desirous to bargaine wth yor said subiecte for the same seaventh parte of the said playhowse and galleries called the Redd Bull wch had then before that tyme byne graunted to the said Thomas Swynnerton for dyvers yeares from thence to come wch the said Phillip Stone pretended and thought [had byn] vnto him well and duly renewed leased and graunted of and in the same by the said Aron Holland he the said Phillip Stone did offer the same to yor said Subiecte for ffiftie pownd*es* makeing him beleeve that he then had a good lease and graunte therof for the same tearme of yeares therein to come whervnto yor said subiecte gyveinge fayeth and credit did accepte the same at the hand and motion of the said Phillipp Stone and gaue him for the same the said ffiftie pound*es* in lawfull money payed according to the said price and offer and thervpon [entered] thervnto and

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did quietlie and peceably possesse and enioye the same seaventh parte accordinglie vntill aboute one quarter of a yeare after that yor said Subiecte beinge then desirous to trauel beyond the Seas tooke his ioyrney and dep*ar*ted out of this yor Ma^{tes} Realme of England wth greate loue frendshipp and kindnes then to him pretended by the said Aron Holland in whom yor said Subiecte then and in his absence reposed much trust and confidence in respect of his faire speeches promises and pretences in trustinge the said Aron Holland wth the rentes yssues and profitt*es* of the said seaventh parte duringe his tyme of absence beyond the Seas, wch he did receaue vntill his retorne for and to the vse of yor said Subiecte and to paye over the same vnto one Anthony Payne a s*er*vant of yor said Subiectes to be disposed as he had appointed the same. But yet he yor said Subiecte did will and appointe the same Anthonie Payne to see the said rente of twelue shillinge*s* and sixe pence quarterlie as it should growe due to be satisfyed and payed duelie vnto the said Aron Holland. W^{ch} when the same Holland found and that that tyme was a fytt tyme and opportunitie in yor said Subiect*es* absence beyond the Seas offered for the said Holland to work his will and porpose for the forfeiture of the same into his hand*es* againe then he plotted to effecte his said drifte or purpose and indeavored vndulie to overthrowe the said interest and tytle of yor said Subiecte and to that intent did wth faire wordes and kind promises of loue care and respecte vnto yor said Subiecte overcome and imboulden the same Anthonie Payne to be remisse and carelesse therein and relye vpon the confidence and trust of the said Aron Holland and vpon his protestac*i*ons not onelie of good will regard and favour to yor said Subiecte to neglecte a daie or two of the said rent quarterlie to be payed as is aforesaid. But alsoe of not takeinge anie advantage against yor said Subiecte but to further and aide him all that the said Aron Holland could therein or in any other matter wch did lye in his power wch the said Anthonie Paine beleevinge to be spoken from his harte and true meaneinge did omitt to observe the daie of payment therof, but wthin a daie or two after tendered and offered the same rente vnto the said Aron Holland wch he refused contrarie to his

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speeches promises and protestacions therein made, and did most conynglie and vnknowne to the said Anthonie Payne demaunde the same rent at the verie daie lymitted and appointed for the payment thereof and for defaulte of payment therof sought and endevored to take all the advantage and benefytt wch he could thereby pretendinge and alledginge a forfeiture and reentrie for the non payment therof, And from that tyme wch was aboute nyne yeares last past hithervnto detayned and kepte the profitt*es* and benefytt of the said seaventh parte to his owne vse and behoffe refusinge to yeild the same or anie parte therof vnto yor said Subiecte or to make unto him any manner of reckoninge or accounte for the same amountinge yearelie to thirtie pownd*es* or theraboutes or yet to gyve or allowe anie thinge at all vnto him for or in consideracon of the said ffiftie pownd*es* by him payed for the same. Whervpon yor said Subiecte exhibited his bill heartofore in this yor Ma^{tes} Courte of Request*es* aboute eight yeares last past to be therein releeved against the said Aron Holland who appearinge thervnto the first of Maie in the seaventh yeare of yor Ma^{tes} raigne of England, answered his said then bill there, And beinge moved and pricked in his conscience somewhat therein did in his then answeare vpon his oath thervnto plainely and trulie confesse, that he thought the said tearme of years ther be efluction of tyme to come and not elapsed he soe made vnto the said Phillipp Stone as is aforesaid did in all equitie belonge and app*er*taine vnto yor said Subiecte the then Complayn^{t}, and did then therein alsoe proffer and offer voluntarilie vpon his oath that if the said then complayn^{t} would well and truly satisfie and pay such somes of money as weare iustlie due vnto the said Aron Holland by the said Phillipp Stone or anie from whome he claymed, he the said Aron Holland would be contented to make a newe lease vnto yor said Subiecte in his owne name wth the like Coven*antes* articles Condicons and agreem*entes* as weare contayned and specified in the same Jndenture formerlie made by him to the said Phillipp Stone whervpon shortlie after that is to saie the three and twenteith day of June in the same eleaventh yeare of yor Ma^{tes} said raigne of England vpon openinge of the same matter before yor Ma^{tes} Counsell of the said Courte of Re-

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questes in presence of the Councell learned of both the said parties, and vpon consideracion had of the said defendtes answeare and other circumstances of the cause And for that the said defendt had not made apparant to the same Courte what monies weare iustlie due vnto him (there beinge in truth none at all) from the said complaynt yt was therefore ordered by yor mates said Councell of the same Courte, that the said Complaynt his executors and administrators should from thencforth haue and receaue the profittes and benefyt of all the premises in as lardge and ample manner and in such manner and forme as he the said Phillipp Stone before him or any other person for or in the behalf of the said Complaynt or of the said Phillipp Stone ever before that time had and enioyed the same wthout the lett deniall disturbance or contradiction of him the said deft or anie other person or persons claymeinge in by from or vnder him vntill such time as other and further order should be in that Courte taken and made (wch hath not hithervnto byne) to the contrarie. And it was then alsoe further ordered That the said Comp:lt should and might drawe a newe Jndenture or deede Jndented to theffecte of the former wth such Covenantes and provisoes as in the said former Jndenture graunted to the said Phillip Stone was contayned wch the said deft should forthwth vpon request in that behalf to be made seale and delyver as his deede and execute the same to all intentes and purposes as the said former Jndenture was made and executed notwthstandinge anie pretended forfeiture therof. And for the other demaundes aswell of the said Complaynt as deft the said parties weare lefte at libertie to proceede accordinge to the ordinarie course of that Courte. And it was lastlie then therby ordered That an Jniunction vnder his Ma:tes privie Seale vpon paine of 300li should be directed to the said defendt and all and every other person and persons claymeinge by from or vnder him to whome in that case it should appertaine for the due performance of the same order as thereby may appeare Whervpon presently after, did according to the same order cause a new paire of Jndentures to be drawen and ingrossed betwene the said Aron Holland and yor said Subiecte like and agreable to the former wch weare soe had and made

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betwene the same Holland and Phillipp Stone as is aforesaid, and did offer and tender the same vnto the said Holland to be sealed and delyvered accordinge to the same order, wch was then alsoe shewed vnto him wth a writt or Jniunction under yor Ma:^tes^ privie Seale de execucione ordinis therein for the performance therof W^ch^ he the said Aron Holland then seemed willinge to doe accordinglie But for asmuch as at that tyme he pretended he was vtterlie vnlearned and illiterate not beinge able to reade; and then knewe not whether the same weare agreable to the former Jndenture, and to the said order he therefore requested yor said Subiecte to forbeare a little tyme and to gyve him soe much libertie onelie as his then Councell Ralphe Wormeleighton Esquier might pervse the same and see whether those newe Jndentures did agree wth the former Jndentures of the said Phillipp Stone and wth the said before recited order because he could not reade them nor compare them togeather promisinge then alsoe that assoone as his said Councell might pervse the same he would seale and delyver the one parte therof as his acte and deede vnto yor said Subiecte if the weare soe agreable or fittinge for him to seale and delyver, The other parte whervnto yor said Subiecte yeilded and delyvered him the same ingrossed booke for that purpose to be seene and pervsed by his said Councell who vpon examinacion therof (as it is saied) fynding it to agree both wth the said order and former Jndenture made to the said Phillipp Stone did narrowlie search consulte and consider with the said Aron Holland howe to find a meanes or way to evade and overreach or prevent the said order, and therby to avoyd the sealinge and delyveringe of the said Jndenture by the said Aron Holland Wherein it is credeably reported and verie like that they thus proceeded and resolved as followeth, That is to saie That he the said Aron Holland should gyve vnto his sayd Councell a good Some of money to crosse the proceedinges of this honorable Courte and to effecte and worke the same And that his said Councell should be bound by his obligacion or bound vnto the said Aron Holland to performe the same and to leaue yor Subiecte without remedie either in lawe or equitie wch was alsoe accomplished. Whervpon they pretended and by agrement be-

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tweene them gaue forth in theire seaverall speeches vnto yor said Subiecte that his said Councell was soe much busied and imployed otherwise that he could intend to p*er*vse and dispatch the same speedilie but must take longer tyme therein wch should then shortlie after be done to the good likeinge and contentment of yor said Subiecte. And then shortlie after they concluded and agreed that his said Councell should move in his Ma^{tes} Bench for a prohibicion in the said Cause, and obtaine and serve the same against yor said Subiecte wch was done accordingly to wch end and purpose the protractinge and lingeringe aforesaid vntill the said prohibicion was graunted was onely invented and soe devised Jn respecte that the said Jndenture made by the said Aron Holland to the said Phillipp Stone was not anie lease at all but onelie an Jndenture of Coven*antes* wch yor said Subiecte before that time did not vnderstand but nowe p*er*ceavinge that the Counsell of yor Ma^{tes} said Courte of Request*es* and he himself had byne soe much deluded and abused therein by his Counsells indirecte procedinges did resorte vnto his owne Counsell learned in the lawe to be therein advised what he should doe whoe did then p*er*swade him to exhibit a newe bill in yor Ma^{tes} said Courte of Request*es* for the same matter in the name of the said Phillipp Stone against the said Aron Holland haveinge authoritie vnder the hand and Seale of the said Phillipp Stone soe to doe, wch he soe alsoe did, and thervpon procured the said Aron Holland to be warned by the then officer or messenger attendinge yor Ma^{tes} said Councell in yor honorable Courte of Whitehall to appeare then and theire to answeare the same newe bill in the said Phillipp Stones name but by the helpe and intervencion of his the said Aron Holland*es* Counsayle to prevent the daunger of his said bond the said Phillip Stone was sought out by one Marie Phillipps for tenn shilling*es* to be brought vnto him the said Holland to be dealte withall and p*er*swaded to drawe the said Phillipp Stone to release (as he thervpon in the end did) the same suite and all Covenant*es* accions and demaund*es* vnto the said Aron Holland to the intent to defraude and defeate yor said Subiecte therein and to avoyde and discharge the same newe bill and defraude the said order

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and the true intent and meaneing therof wch new bill he the same Aron Holland could not otherwise answere or avoyde then by pleadinge therevnto (as he did the same release soe made and gotten from the said Phillipp Stone vndulie and vnconscionably and by [fraude] coveyne and deciepte as aforesaid) to the p*rei*udice and hurte of yor said Subiecte and to the manifest abuse and apparant contempte of this honorable Courte. Sithence wch tyme soe it is alsoe if it may please yor Matie That the said two seau*er*all dee*des* or Jndentures made by the said Aron Holland to the said Phillipp Stone, and thother by the said Phillipp Stone vnto yor said Subiecte and both of them of right belonginge and app*er*tayning to him yor said Subiecte are nowe by casuall meanes come vnto the hand*es* and possession of the said Aron Holland and Phillip Stone whoe by coullo^r^ of haueinge therof haue not onely vniustly and wrongfully without anie lawfull right entered into the same premises therby demised or intended to be so graunted But alsoe haue betweene themselues and certaine other p*er*sons to yor said Subiecte as yet vnknowne made and contryved certaine secrett and subtill estat*es* and Convayanc*es* of and in the premises to the intent yor said Subiecte should not knowe whome to sue for the same and for the rent*es* yssues and profitt*es* of the premises by them receiued and detayned vniustlie and vnconsionably from yor said Subiecte for wch therefore and that he doeth not knowe either the certaine and sure content*es* or dates of the same seau*er*all dee*des* indented and release or wherein the same are or either of them is contayned whither in bagge or boxe sealed Chest truncke or Cubbord locked or otherwise, yor said Subiecte is w^thout^ all remedie by the strickt course of the Comon lawes of this Realme or elswhears then in equitie In tender consideracion wherof And to thend and purpose that the full and whole truth therein concerninge the said matters and p*re*mises may appeare by the Answeares of the said Aron Holland and Phillip Stone vpon theire oathes wch yor said Subiecte hopeth that they will confesse and desireth may be done accordinglie And for that alsoe yor said Subiecte maybe righted and releeved therein and the said Courte satisfyed at leangth for the same And that the said order of this Courte should not be

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deluded and defrauded but iustly satisfyed and performed accordinge to theffecte and true meaneinge therof And alsoe that the said Aron Holland may be compelled to make good and performe his owne offer vpon his oathes aforesaid voluntarily made by his said Answeare and accepted by yor said Subiecte and the said Courte accordinge to the said recited order As by all lawes he should and ought to doe And that the meane profittes by them vniustly detayned may be restored allsoe to yor said Subiecte May it therefore please yor Ma:^{tie} to graunte vnto yor subiecte yor Ma:^{tes} most gracious writt of Privie Seale to be directed to the said Aron Holland and Phillip Stone thereby comaundinge them and either of them at a certaine day and vnder a certaine paine therein to be lymitted to be and appeare before yor Ma:^{tie} and Councell of Whitehall then and there to answeare the premises And further to stand to and abide such further order and direction therein And [sic = as] to yor Ma:^{tie} and yor said Councell shalbe thought fittinge And yor said Subiecte accordinge to his bounden dutie shall pray &c. Ralphe Wilbraham

HOLLAND'S ANSWER

[Damaged. Small part of upper left hand corner gone. Date line placed there partly gone, partly illegible. Whole document difficult to read; ink sometimes rubbed or mouldered off].

The Answere of Aron Holland gent def^{t} to the vntrue and scandalous Bill of Thomas woodford alias Simball yeoman Comp.^{lt}/

The [said defendant] by protestacon not Confessinge anie the thinges or matters in and by the said Bill of Complainte Contained to be true in such sorte manner and forme [as in] and by the same they are and bin Contained, but verily thinketh this suite is meerely begunne to putt this def.^{t} to vnnecessary Costes and Charges in the lawe rather [then] vppon anie iuste or true grounde soe to doe, And the rather this def.^{t} is induced soe to thinke for that the pl.^{t} was in the very same suite formerly by him exhibited [in] this Courte againste this def.^{t} after manie mocions & vppon longe debatinge of the Cause in his Ma:^{tes} high Courte

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of Kinges Bench in the presence of Councell learned [on] bothe sides *pro*hibited by his Ma^tes^ most gracious writt of prohibic*i*on beareinge date [the] Sexto die Novembr*is* 11 [Anno] R Rs Jacobi wch accordingly was served vppon him his Councell and Att[orney] in the said Corte of Request*es* wherevppon hee surcessed his said vexacious suite but after Com*m*enced the like suite in the name of the said Phillipp Stone in the Bill mencioned w^thout^ his priuity as the said Stone said and testified vnder his hand when takinge notice thereof very honestly vnder his hand and seale disavowed & disclaimed the said suite as in & by the same ready to be shewed to this Ho:^ble^ Courte may appeare, wherevppon this def.^t^ was againe dismissed and not herew^th^ Contented the said Woodford for farther vexac*i*on Comenced suite againste this def.^t^ in the name of the said Phillip Stone in his Ma:^tes^ high Courte of Kinges Bench & w^thout^ his privity as this def.^t^ verily thinketh it beinge followed & sollicited by the said woodford and att his Cost*es* & Charges as this def.^t^ hath Crediblye heard, wch suite Cominge to tryall before the right Ho.^ble^ the now Lord Cheefe Justice of England in the Guildhall london after full evidence the matter beinge proved Cleere for this def.^t^ the said Phillip Stone became nonsuit, Att wch tryall the badd dealinge of the said woodford was apparantlie proved before his good Lordshipp And this def.^t^ denieth hee ever did abuse the said Mr Phillipp Stone, or that the said Jndenture of graunte was otherwise made to him then accordinge to his owne agreem.^t^ & by his owne Consent direccon and advise & by his owne Councell for this def.^t^ saith hee is vnlettered & therefore referred the same in all thinges to the truste & Care of the said Phillipp Stone, And this def.^t^ directly denieth that M.^r^ wormlaighton his Councell did ever give him anie manner of advise to frustrate the orders of this Courte, for he saithe Mr Clement Gouldsmith was then of Councell wth him and in whome this def.^t^ relyed and what was done therein and all thinges touching that suite or procureinge the said prohibicon was done by the advise of the said Mr Gouldsmithe and not by the said Mr Wormlaighton, And therefore this def.^t^ saith vppon his othe that the said M.^r^ wormlaighton did never become bound by anie bond or obligac*i*on vnto this def.^t^ to

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doe or p*er*forme anie thinge as in & by the Bill is moste slanderously and wthout anie p*re*text or shadowe of truthe alleaged or was ever bound to this def.^{t} for anie Cause or thinge whatsoever and as this def.^{t} verily beleeveth in his Conscience the Comp.^{lt} meerely suggesteth & deviseth the same of his owne head wthout anye Color of truthe soe to doe, And this def.^{t} further saithe that longe after all the surmises in the said Bill mencioned & to purchase his peace in his old age especially againste soe Contentious and bad a p*er*son as the Comp.^{lt} is knowne to be both to reverend Judges & other Justic*es* & Jurors, This def^{t} repaired to the said Phillipp Stone and acquainted him wth the Comp^{lt*s} Courses, And therevppon for such Consider*ac*ions as was agreed betwixt them he the said Phillip Stone did by his release vnder his hand & seale beareinge date xvjth daye of Maye in the twelfe yeare of his Ma^{t**} Raigne that nowe is very voluntarily and freely remise and release vnto this def.^{t} all manner of Accon*es* suites, Covenant*es*, and demaund*es* as in & by the same vnto wch Relacion had for the more Certainty doth and may appeare And therefore this def.^{t} doth demurr and abide in lawe and humblie demaund Judm.^{t} of this Ho:^{ble} Courte whether this def.^{t} shalbe Compelled to make anie other or further Answere to the said scandalous Bill of Comp^{lt} or matters thereby sett forth And this def.^{t} denieth that hee hath or ever had anie the deed*es* Jndented in the Bill mencioned or anie other deed*es* whatsoever that belonge or ever did belonge to the said Phillipp Stone or the said Comp.^{lt} wthout that, that anie other matter thinge or thinges materiall or effectuall in the said Bill of Complaint Conteyned & not by him sufficiently Confessed & avoyded, Traversed or denyed is true, All wch matters this def.^{t} is & wilbe ready to Averr iustifie maintaine & prove as this most Ho:^{ble} Courte shall award And humblie prayeth to be hence dismissed wth his reasonable Cost*es* & Charges in this behalfe most wrongfully susteyned./

R: Wormlaighton.

Appearance Book, 16–17 James I [Not numbered and not paged. Found among the uncalendered Proceedings and miscellaneous papers. Labeled, "Liber Emptae".]

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[31 May, 17 James I.]

Aron Holland *per*sonaliter comp*a*ret cor*am* Con*silio* p*er* manda-tu*m* nuncij Camer*ae* ad sect*am* Thom*ae* Woodford &c postea viz Septimo die Ju mens*is* instan*tis* Admiss*us* est p*er* Cō: con-*silio* Wormlaighton

III

THE RED BULL COMPANY.

The Woodford-Holland suit grows out of relations of share-holders in regard to ownership and profits. The Smith-Beeston suit grows out of equally unhappy relations of the company in its expenditures for playing apparel, furniture, and other necessaries.

The history of the Red Bull company is only in part known. Early in the reign of James I, very possibly in 1603 as has been surmised, the Earl of Worcester's players became Queen Anne's servants. Collier published an undated draft for a patent to them as acting at the Curtain and Boar's Head, which must date 1603. I have not seen the original. The earliest declared date of their new patronage is March 15, 1604, when they were granted red cloth for the King's coronation, as already mentioned. The patent of 15 April, 7 James I (1609), also previously mentioned, furnishes the earliest date hitherto known of their acting at the Red Bull. The Woodford-Holland documents show that the Red Bull was built in or before 1605, and that Thomas Swynnerton, one of the Queen's company, in that year owned a share in it. When all these evidences are examined, it becomes as certain as circumstances unsupported by contemporary declaration can make it, that Queen Anne's company occupied the Red Bull continuously from the time of its erection, which must have been, on the same evidences, sometime between 1603 and 1605, till their dissolution, 1619.

There were originally ten actors in the company. In the 1604 grant of red cloth, as also in the undated draft for patent, and finally in the 1609 patent, they were, as there put down, Thomas Greene, Christopher Beeston, Thomas Heywood, Richard Perkins,

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Richard [Robert] Pallant, Thomas Swynnerton, John Duke, Robert Lee, Jacob [James] Hoult, Robert Beeston. During the course of years the membership changed, so that at the time of the Smith-Beeston suit and the Chancery suit before referred to, there are a number of new names.

In 1612 Thomas Green died. He was one of the chief actors of Shakespeare's time, and was to Queen Anne's company what Burbage was to the Globe company, or Nat Field to the Children of the Revels at Blackfriars, or Joseph Taylor to the various companies he associated himself with. With Green's death began those conditions of the Red Bull actors that in the next seven years prepared for the final dissolution that came with the death of the Queen. A portion of their troubles are related in the Chancery suit. Others are here told in the Smith-Beeston controversy.

When Green died, the choice of the company fell upon his friend, Christopher Beeston, to take his place as general director and business manager. Beeston was well-to-do, while his associate actors were not men of any means. Every man in the company, these documents say, had to have some office, and his was one that required a man of business capacity and financial standing to secure the company's credit and existence. How unsatisfactorily he filled his post these records let us know. Possibly from an earlier date, but certainly from 1612 to 1619, he purchased all apparel, furniture, and other things necessary for setting forth plays. For this purpose the company allowed him one-half the receipts from the galleries,—an amount which, unfortunately, is not more definitely stated.

In 1612, Beeston arranged with John Smith to furnish the company all tinsel stuffs and other loom stuffs that might be required. Between 27 June of that year and 20 February, 1616, when the company began to break up with dissensions, Smith delivered goods to the value of 46*l.* 5*s.* 8*d.*, which, he claims, were never paid for. This is the immediate cause of the present suit. The larger cause is in the relations of the company, and

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Beeston's unsatisfactory manner of handling the money and rendering account.

Beeston apparently in 1616 was unable to give a satisfactory explanation of his expenditures, particularly of 400 *l.*, of the company's money. Some of the members in that year left and joined others. The Queen's men from that time to her death seem to have had their full share of variance and strife. When the death of Queen Anne finally dissolved them, some went to other theatres, some quit the profession, while the rest still held together and formed a new organization at the Red Bull under the name of the company of the Revels,—a name made popular by long association with successful performances of young men at the Blackfriars and Whitefriars. At the breaking up, Beeston went as manager to Prince Charles's company. He took with him, it is claimed, also all the apparel and furniture of the Red Bull stage, in spite of the fact that it had been bought with the company's money.

Under the above conditions, Smith could not, he claims, get the money due him, and so brought this suit a few months after the Queen's death and the company's disbanding.

Why Emanuel Read never appears in plays after about 1616 is explained, not by his death, as others have supposed, but by the fact that he took up permanent residence in Ireland about 1616 or 1617, as Mrs. Richard Perkins testifies.

The case dragged on for a year, chiefly through delays interposed by Beeston. Smith's affidavit of 4 November, 1620, shows the popular contempt, as exhibited in Beeston's attitude, for the Court of Requests. This was but a natural result of the stubborn conflict of authority between that court and the King's Bench, culminating twenty-five years later in victory for the King's Bench and the abolition of the Court of Requests.

The series of documents in the Smith-Beeston controversy is almost intact. Only the final decree of the court seems lacking. They are here presented in chronological order.

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SMITH VS BEESTON

Court of Requests Proceedings, Uncalendered, James I. [1619.]

SMITH'S BILL

[Date of filing, *in dorso*] x° die Novembris Anno Rni Rg Jacobi Angl fr et hib*er*nie xvij° et Scotie lxiij°
Defend vocet^r^ *per* nunc*ium* Camer.

To the Kings most Exellent Matie./

Humbly complayning sheweth vnto your most exellent Matie your faithfull and obedient subiect John Smith Citizen and ffishmonger of London That Whereas your said Subiect did heretofore betweene the Seaven and twentith daie of June in the yeare of our Lord God One thousand six hundred and twelve and the three and twentith daie off ffebruary Anno D*omi*ni One thousand Six hundred and Sixteene at the earnest request and intreaty of one Christofer Beeston deliu*er* or cause to be deliu*er*ed vnto him the said Christofer Beeston and his Assignes and at his request and by his direccion vnto and for the vse of the Company of players at the Redd Bull neere St Jones vizt vnto Ellis Worth Richard Perkins and John Comber and others diverse tinsell stuff*es* and other stuffe for their vse in playing amounting in the wholl to ffourtie six pound*es* five shillings and eight pence or thereabout*es* And the said Christofer Beeston did faithfully promis to make payment vnto your said subiect and to satisfie him for the said stuffe. Now soe it is may it please your most exellent Matie that your said subiect having deliu*er*ed the said stuff*es* by the appointment of the said Beeston as aforesaid vnto him or his assignes And althoughe the said Beeston doth well know that the said stuff*es* were deliu*er*ed vnto him & vnto his vse and by his appointment And that the seu*er*all p*ar*cell*es* deliu*er*ed as aforesaid did amount vnto the said some of ffourtie six pound*es* five shilling*es* & eight pence or thereabout*es* according to the seu*er*all rat*es* and pric*es* agreed vpon by the said Beeston or his Assignes And that the said Beeston Ellis Worth

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Richard Perkins and John Cumber or some of them have since the deliuerie thereof pervsed the same by your said Subiectes booke and well know that the said some of ffourtie six poundes five shillinges & eight pence is due vnto your said Subiect for the same And that your said Subiect since the deliuerie thereof hath in most kinde and frendly maner required payment of the said Beeston And that the said Beeston hath faithfully from time to time promised vnto your said Subiect payment & satisfaccion for the same Yet now of late the said Christofer Beeston Ellis Worth Richard Perkins and John Cumber combyning themselves together how to deceave your said Subiect of his just and true debt, and have intised over Thomas Chambers your said Subiectes servant from your said Subiectes service and caused him to absent himselfe vnto some parte beyond the Seas or into some vnknowne & remote place From your said Subiect where your said Subiect cannot heare of him knowing that your subiectes said servant was the onlie witnes wch your said Subiect had to prove the deliuerie of the said Stuffes as aforesaid and of the contract aforesaid And now the said Beeston and the said Worth Perkins and Comber doe give forth & report that they or some of them by the appointment of the said Beeston have paid and discharged the said debt of ffourtie six poundes five shillings & eight pence vnto your Subiect or vnto his said servant whereas in truth they nor either of them have satisfied any peny thereof but deteyne the said some of ffourty six poundes five shillinges and eight pence in his their or some of their handes and intend vtterly to defeate your said Subiect of the same And your said Subiect further sheweth that the said Beeston, Worth, Perkins, and Cumber have heretofore and since your said Subiectes deliuerie of the said stuffes as aforesaid falling at variance and strife amongst themselves and separated and devided themselves into other Companies. And vpon their separacion did acknowledge your said Subiectes debt but questioned betweene themselves wch of them should paie and discharge your said Subiect So that by their variance and for want of sufficient witnesses to prove the deliuerie of the said stuffes and promis for the same your said Subiect is likelie to loose the said debt except he be releived by

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your Matie in equitie for the same In tender consideracion whereof & for that your said Subiect hath noe witnesses to prove the deliu*er*ie of the said stuff*es* nor the promis of the said Beeston and since of the said Worth Perkins and Cumber vnto your said Subiect for the payment thereof but hopeth that the said Christofer Beeston Ellis Worth Richard Perkins and John Comber will vpon their Corporall oathes confesse and acknowledge what stuff*es* or other wares they or anie of them or any other to their or any of their vse or vses have had and receaved from your said subiect or his said s*er*vant or anie other your said subiect*es* s*er*vant*es* and by whose appointment and direccion and vpon whose Accompt And whether the said Beeston Worth Perkins and Cumber or some of them did not vndertake to paie for the same or wch of them or who vndertooke the same And also what money they or anie of them have made payment of the said ffourty six pound*es* ffive shillings and eight pence or anie part thereof, and how much they or anie of them have paid thereof and by whose hand*es* & appointment And whether the said Beeston did not from time to time give direccions for all such somes as were paid, and how much is remayning vnpaid vnto your said Subiect of the said debt of ffourtie six pound*es* five shilling*es* and eight pence and wch of them ought to pay the same May it therefore please your most excellent Ma^ty the p*re*mises considered to grant vnto your said Subiect your Maties most graceous writt of privie Seale to be directed to the said Christofer Beeston Ellis worth Richard Perkins and John Cumber Comanding them and every of them thereby at a certen daie and vnder a certen paine therein to be lymitted p*er*sonally to be and appeare before your most excellent Matie in your Maties Court at whitehall Comonly called the Court of Request*es* then & there to answer the p*re*mises and every p*ar*te thereof, and further to stand to and abide such further Order & direccion therein as to your most excellent Maiesty shall seeme to stand wth equitie and good conscience And your said Subiect according to his bounden dutie shall dailie pray for your Maties long health and happie reigne over vs

Wm Tayler./.

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WORTH, CUMBER, AND PERKINS'S ANSWER

xviij° die Novembris
Anno R Regis Jacobi Angl
ffranc et hibnie xvij° et Scotie liij°./

The ioynt and seuerall answers of Ellis Worth, Richard Perkins, and John Cumber defend^tes to the Bill of Comp.^lt of John Smith Compl.^t

The advantage of exception to the incertentie insufficiency wants faults and ymperfeccions of the Bill of Comp.^lt vnto these Defend.^tes and every of them nowe and att all tymes hereafter saved for full answer and perfect Declaracion of the truth for such matters wherewith they and every of them stand chardged in and by the said Bill they and every of them saye in manner & forme followinge And first theis Defend.^tes saie That the said Christopher Beeston in the Bill of Compl.^t named and theis Defend.^tes haue for Divers yeeres past beene the Actors & servants of the late Queene Anne of famous memorie & haue Dureinge theis yeeres beene a companie & sett forth Divers plaies & comedies att the Redd bull neare St Jones in London for the better orderinge and setting forth of wch said plaies & comedies there required Divers officers and that every one of the said Actors should take vpon them some place & charge & for that the prouision of the furniture & apparrell was a place of greatest chardge & trust and must of necessitie fall vpon a thriueing man & one that was of abilitie & meanes itt was agreed by and betweene the said Companie of Actors in manner and forme following That is to saye that the said Christopher Beeston in the bill of Comp.^lt named should Defaulke outt of the collecciones and gatheringes wch were made continually whensoeuer any playe was acted a certen some of money as a comon stock towardes the buyeing & Defraying of the charges of the furniture & apparrell aforesaid And that the said Christopher Beeston should buy all the furniture apparrell & other necessaries wch should be requisite for there condicion & qualitie And that the said Christopher Beeston should wth the said comon stock soe collected paye for the said comodities by him hereafter to be bought or other wise that the said comodities should stand vpon the sole

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& prop*er* accompt & hèad of the said Beeston & that noe other of the companie should be troubled or ymployed in this busines or should paye or stand charged or lyable for any comodities soe by the said Christopher Beeston to be bought butt that the said Christopher Beeston should discharge & free the Company & paye all such moneyes as should arise by reason thereof & if there did fall outt any surplusage or remainder of the Com*m*on stocke & money soe by him to be gathered, that then the said Beeston should give a true accompt vnto the company & that every one of them should haue a share & part according to there place & qualitie & vpon this agreem^{t} the said Christopher Beeston did vndertake this chardge & trust & hath for the space of seaven or eight yeeres continually when there was any playe, Deducted & Defaulked divers greate somes of money outt of the collecc*i*ons & gatheringes aforesaid & hath wth the said moneyes much enritched himself as these Defd.^{tes} conceaue, and besides did att one tyme yeald vnto these defend^{tes} as they verily thinke a false accompte of fower hundred poundes wch the said Beeston confessed he had collected togeather, & Did by the said accompte pretend that he had Disbursed the same for the good and benefitt of the Company & hath wth the said moneyes bought all the furniture & apperell vntill that tyme vsed the wch these Defend.^{tes} could nott tell howe to disprooue for the said Beeston according to the former agreem.^{t} did what hee listed, & of himself wthoutt the privitie Direcc*i*on or knowledge of any of these Defend^{tes} bought of Divers men Divers comodities & hath as the sd Defend^{tes} verely beleeue payd for the same in regard there was neuer any tradsman since the agreem^{t} aforesaid butt this comp.^{lt} that ever Demanded any money of these Defend^{tes} or any of them for comodities soe bought by the saide Christopher Beeston neither Doe these Defend^{tes} or any of them knowe of whom the said Christopher Beeston Did vse to buy the app*ar*ell & comodities aforesaid, or what contracts coven*aun*t*es* & agreem^{tes} he made wth them, or certenly knowe whether the said Christopher Beeston payd readie money for the said comodities or tooke them vpon his creditt & accompt neither Doe these Defend^{tes} knowe that the said Christopher Beeston Did ever buy any comodities

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of the said Comp.lt or that the Comp.lt did att any tyme att the earnest request & intreatie of the said Christopher Deliuer or cause to be Deliuered vnto the said Christopher Beeston or his assignes & att his request & by his Direccion vnto & for the vse of these Defendtes Divers tinsell stuffes & other stuffes for there vses amounteing to the some of fortie six poundes fyve shillinges & eight pence or theire abouts neither Doe these Defendtes or any of them knowe if the said Christopher Beeston Did take vpp the said stuffes whether the said Christopher Beeston did paye readye money for them or whether he did faithfullie make promise to make payemt to the Comp.lt or to satisfie him for the said stuffes or whether he hath from tyme to tyme promised the Comp.lt payemt & satisfaccion for the same. Butt if the said Beeston did buy any such stuffes of the Comp.lt & made the agreem.tes promises & contracts aforesaid then these Defendtes Doe verylie beleeue that the said Beeston & the Comp.lt are combined togeather & doe practise to trouble & molest these Defend.tes hopeing thereby either to come by some composition or otherwise some couller for the said Beeston to exclayme on these Defend.tes & the rest of the companie. Wthout that these Defend.tes since the Deliuery of the said stuffes pervsed the said Compltes bookes & Doe knowe yt the said some of fortie six poundes fyve shillinges & eight pence or any parte or parcell thereof is Due to the Complt for the same & wthoutt that the said Christopher Beeston & these Defend.tes Did combine themselues togeather how to Deceaue the Complt of his iust & due Debt, or that these Defend.tes did ever knowe the said Thomas Chambers the Compltes seruant or ever inticed the said Thomas Chambers from the Compltes seruice or ever caused him to absent him self into some partes beyond the seas or vnto some vnknowen & remote place where the Complt cannott heare of him or that these Defendtes Did knowe that the said Thomas Chambers was the onely witnes the Complt had to prooue the Deliuery of the said stuffes & contract aforesaid And wthoutt that theis Defendtes or any of them haue given outt and reported that they or any of them by the appointmt of the said Beeston hath paid & Dis-

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charged the said Debt of fortie six poundes five shillings & eight pence vnto the said Comp.lt or vnto his said servant & wthoutt that the sd Defend.tes or any of them vpon the separacion made by Beeston & these Defendtes Did acknowledge the Compltes Debt or questioned betweene themselues wch of these Defend.tes should paie the Compltes Debt. Butt true itt is that the said Beeston haueing from the begining a greater care for his owne privatt gaine & nott respecting the good of these Defend.tes & the rest of his fellowes & companions hath in the place & trust aforesaid much enritched himself, & hath of late given over his coate & condicion & separated & Devided himself from these Defend.tes carriing awaie nott onely all the furniture & apparell parte whereof is pretended by the said Comp.lt to be made wth his stuff & still to be payd for butt alsoe suffering the complt to sue molest & trouble these Defendtes notwthstanding these Defend.tes doe knowe yt the said Beeston would nott haue engaged himself for any stuff vnlesse the said Beeston had formerlie receaued outt of the collecc*i*ons aforesaid as much money as would haue answered for the same And notwthstanding these Defendtes hopeth that the said Beeston will vpon his corporall oath confesse that he hath receaued satisfacc*i*on for the said stuff*es* if any such were bought contrarie to all equetie and good conscience by reason of whoes vnconsionable and extreame Dealeinges there was greate variance & striffe betweene the said Defend.tes & the said Beeston vpon there sepa*ra*cion as in the said bill of complt is surmised And wthoutt that these Defendtes or any of them Did ever promise the Comp.lt to paye for the said stuff*es* pretended by his bill of Comp.lt to be Deliu*er*ed vnto the said Beeston or his assignes or Did ever vndertake the payemt thereof or that these Defend.tes or any of them or any other by there appointm.t & Direcc*i*on haue had & receaued of the Comp.lt or of his said servant or of any other of the Comp.ltes servants any stuff*es* or wares whatsoeuer And wthoutt that any other matter cause or thinge in the said bill of Complt materiall for these Defend.tes to answere vnto & therein nott sufficiently answered vnto are true. All wch matters these Defendtes are & will be readie to averr &

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prooue as this ho.ble court shall award & humblie prayeth to be Dismissed wth there reasonable costes & charges in this behalf wrongfully susteyned./ Robert Wolrych

Appearance Book, 16–17 James I. [Not numbered nor paged. Found among the uncalendered Proceedings and miscellaneous papers. Labeled "Liber Emptae."]

[18 November, 17 James I.]

Xpofer Beston personaliter comparet coram consilio regis per mandatum nuncij Ad sectam Johannis Smithe postea viz xxiij° die mensis instantis Admissus est per Langley consilio magistri Gosnolde

BEESTON'S ANSWER

xxiij° die Novembris Anno Regni Regis Jacobi Angliæ ffranc et Hiberniæ xvij° et Scotiæ quinquagessimo tertio./ *1619./*

Langley pro defendt

The answere of Christopher Beston one of the defendantes to the bill of Comp.t of Iohn Smyth Comp.t

The said Defendant (for somuch as concernes himself) saith, that the said bill of Complaint, is soe vncertein, and otherwise insufficient in lawe, as it is vnpossible to make any Direct answere therevnto, for many respectes; and namely in that the Complaynant chargeth the said Defendt; or his assignes in the Disiunctive, and vncerteinly, (not nameinge or putting any of them in certein) to haue had and received certen tinsell stuffes and other stuffes of the Complaynt, not settinge Downe what other stuffes, nor how much of every kind nor the severall prices thereof, which himself (having best notice of (if any such had ben) ought to haue ben Declared in Certeintye; Soe that the defendant cannot conceive that the Complaynant hath any other scope or intention in this suite, but onely to vex, and molest this Defendant (havinge had a long tyme of sicknes, and at this tyme being very sickely and vnfitt to followe suytes; and therefore the more likely in

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his opinion, to yeeld to any vnreasonable demaunde*s* (though there be noe iust Cause of Complaint;). and the rather because the matter in question (havinge slept these many yeeres, and the Company of Commedians that are supposed in the pl*aintiffes* bill to haue contracted with him the said Defendant for the said stuffe*s* (being since altered, and the parties sep*ar*ated and dis-p*er*sed amongst other Companyes) the sayd Complaynant finde*s* it the more hard for him, to satisfie himself of the said Complaynt^tes^ vniust demaunde*s*, and therefore he settes vpon this Defendant (being a settled Inhabitant neere vnto him, and the likeliest to be answerable for whatsoever he seeke*s* to recover). for which cause, and for these other imp*er*fections in this bill, he verily hopes, and humbly prayes, to be Discharged from makinge any further answer, and to be dismised wth Coste*s*, And yet neue*r*theles (saving to himself the benefitt and advantage of these, and all other iust exceptions, for better manifestac*i*on of the truth, and satisfacc*i*on of this honor.^ble^ Court, he further answereth and saith that true it is that about the time mentioned in the said bill, the said Defendant was one of the said Company of Comedians attendinge vpon the late Queenes Maiestie vntill after her Ma^tes^ Decease, he entred into the service of the most noble Prince Charles/ at which time, whatsoever others of the societye ought vnto the Complaynant) he this Defendant Did owe him nothinge, neyther Did he ever sythence nor before to his knowledge question with any of them who should be his paymaistere*s* (as he in his bill vntruly informeth, but that there were at that time tenne of that Company (whereof the said Defendante*s* were fower) were sharers wth the rest and that their vsuall manner was, that sometymes one, and sometymes another of the said Company Did provide Clothes and other necessaries for the settinge forth of the actors of that Company; And that what parcelle*s* of stuffe*s* or other provisions the rest of them bought or procured for them, he this Defendant is alltogeather ignorant; but for his owne p*ar*ticular he Directly answereth and saith, that he Did never request the said Complaynant to Deliver

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vnto him or any assigne of his any such tinsell stuffes or other stuffes, but such as he bought for himself or his Children, for which he allwayes payd ready money; Nor did ever promise vnto the Complaynant, or any other to paye the sayd some of ffortye six poundes five shillinges eight pence mentioned in the said bill, nor any parte thereof; Neither did the said Comp.t Deliver any such stuffes vnto the said Defendant, nor any other by his appointment, nor (as farr as he knowes) to his vse, as in the sayd bill is vntruly alledged/ And further saith, that he this Deft, Did never make agreement with the sayd Complaynant to paye the sayd somme of xlvj.l v.s viijd, or any other somme or somes of moneyes, for the said stuffes; Neyther Did the sayd Defendant Beeston pervse the sayd Complaynantes bookes of accompte, nor did by that meanes, or any other, vnderstand that any such somme or somes of money were due vnto him (other then what he the sayd Defendaunt paid ready money for, as is aforesaid/ Nor Did he the sayd Defendant ever promise to make vnto the said Complaynant, any payment or satisfaccion for the said stuffes, Nor did Combine with the rest of the defendantes or any of them, to defraud the sayd Complaynaunt of the said moneyes, nor any part thereof; Neither Did he the sayd Defendant direct any, to give out that the sayd moneyes were formerly payd vnto the Complaynant, as is vntruly laid downe in the said bill./ And further he the sayd Defendant Denyeth that ever he enticed away the sayd Thomas Chambers mencioned in the sayd bill to be the Complaynantes servant/ Whereby he should forsake his sayd Maister, or absent himself (of purpose) to Disable or disarme him of meanes to proove the matter in demaund nor for any other purpose whatsoever, for that (to this Defendantes remembrance) he never knewe the said Chambers in all his liefe; All which thinges are vntruely informed in the sayd bill of Complaint, without that, that any other matter materiall in the sayd bill to be answered vnto, and not Confessed nor avoyded, traversed or denied, is true; All which he this Defendant is ready to averr and proove, as this honorable Court shall award; And therefore humbly

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prayes (as formerly he hath don) to be dismissed with his reasonable Costes and Charges in this suite wrongfully sustained./

H. Gosnold:

Witness Book, Easter Term, 18 James I, vol. 200.

John Smythe	
pl	Tho: Somerscales gent William ffreshwater Japhath Weale
Xpofer Beeston gent deft	John King/

Court of Requests Proceedings, Uncalendered, James I. [May, 1620.]

INTERROGATORIES

Interrogatories to be ministred vnto witnesses to be produced on the parte and behalfe of John Smith plt against Christopher Beeston defendt

1 Inprimis whether doe you knowe the parties, plaintiff and defendtes or either of them

2 Itm whether doe you knowe that the defend.t Christopher Beeston in or about the yeare of our Lord God One thousand six hundred and twelve did request the complainant to deliver from time to time vnto the Companie of Players for the time then being at the Redd Bull in S.t Johns streete diverse tinsell stuffes and other stuffes for their vse in playing or what contract or promis did the said Beeston make vnto the plaintiff concerning any such stuffes to be delivered to the said Companie or vnto any of them and about what time

3 Itm whether doe you know who did vndertake for such wares or stuffes or other thinges as were from time to time in the yeare of our Lord 1612 and soe afterwardes for diverse yeares delivered vnto and for the companie of Players aforesaid and vnto their vse and in whose name and by whose directions were all or anie such wares or stuffes provided

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4 Itm vnto whome did the said Companie give any allowance for or towardes the satisfyinge of the said stuffes or any of them and what allowance did they give vnto any person or persons and vnto whome and at what time and in what manner did they allowe the same

5 Itm how long did the said Companie continewe together after the plaintiff began to deliver wares vnto them and when did they disperse or seperate themselves and whoe had the apparell or other thinges which were made of the stuffes which the plaintiff delivered vnto the said Companie or vnto whose vse were the same Converted and by whose appointment or what became of the same.

6 Itm whether hath not the defend Beeston lately pervsed the pltes booke or bookes of parcelles wherein the said stuffes were expressed and set downe and about what time and to what valewe did the same stuffes amount vnto at the rates therein sett downe and whether did the said Beeston acknowledge the receipte thereof and allowe of the rates and prices according as they were sett downe in the said bookes and what did the same amount vnto and what speeches did the said Beeston then vtter or speake concerning the same

7 Itm whether is the booke of parcells wherein the said stuffes were sett downe which were delivered by the plaintiff vnto the said companie now shewed vnto you and whether did not the said Beeston pervse the same and allowe thereof and whether was not the said Booke then when the said Beeston pervsed or allowed of the same as the same now is and what can you say concerning the contentes of this interrogatorie./

8 Itm what speeches did the defend.t Beeston at any time vtter since this suite commenced touching the putting in of his answer or anie faulse answer into this Court declare the whole knowledge herein./ And did not the saide Beeston say that it twas not punishable

9 Itm whether doe you knowe that the defendt Beeston made paym.t of any some or somes of money parcell or in parte of paym.t of any such stuffs delivered vnto the said companie and how much

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thereof hath he payed vnto the pl*aintiff* or vnto anie of his servantes or vnto any for his vse./

Court of Requests Proceedings, Uncalendered, James I. [5 May, 1620.]

DEPOSITIONS.

Ex p*arte* Quer*entis.*/ Deposiciones Capt*ae* apud Westm*onasterium* quinto die Maij Anno Regni dom*ini* nost*ri* Jacobi Angl*iae* Reg*is* &c xviij^{uo} et Scotie liij^{tio} *1620.*/ ex p*ar*te Johis Smith Quer*entis versus* Christofer Beeston def.^{t}/

Thomas som*er*skales of the p*ar*ysh of St Michell Bashingshawe Lo*ndon* Armorer of thage of xlv yeres or thraboute*s* sworne, and p*ro*duced to be ex*amined* vppon the 1–6. 7. Jnter the day and yeare abouesayd deposeth and sayth./

1 To the first Jnter this dep^{t} sayth he knoweth the p*ar*ties pl*aintiff* and def.^{t}/

6 To the vjth Jnter this dep^{t} sayth that the def.^{t} Beeston hath lately (vizt since the beginning of the suite now dependinge between the def.^{t} and the now Comp.^{l}) seene and p*er*used, in the p*re*sence of this dep^{t} the pl^{tes} shopp book or Book*es* of accompt; in wch book or book*es* were sett downe and exp*re*ssed diu*er*se & seu*er*all p*ar*celle*s* of Tynsell stuffe and oth^{er} stuffes, wch the sayd defend^{t} Confessed to haue receyued from the compl^{t} in p*ar*te hym selfe and some p*ar*te therof, he the def^{t} had sent for by oth^{ers} & receyued lykewyse, wch sayd seu*er*all p*ar*cells did accordinge to the rat*es* therein sett downe amownt & come to the some of xlvj.^{li} v.^{s} viij^{d} or th*er*eboute*s*: All wch seu*er*all p*ar*cells the sayd Beeston acknowledged the receipt of & allowed the rat*es* & prises, they were sett att, by the sayd book or book*es* of accompt aforesayd: And the sayd Beeston did then furth^{er} in the hearinge of this dep^{t} Confesse & say that he did beleyue in his Conscience, the sayd p*ar*cells were truly sett downe & requested the Compl.^{t} to forbeare to take an attachm^{t} owt of this honor*able* Cou*r*te, agaynst hym the def.^{t} & to doe his best Indeuo^{r} that some oth^{rs} of the Company might pay some of the dett behynd for the p*ar*cells aforesayd./

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7. To the 7th Inter this dep^{t} sayth that the book now shewed vnto hym at the tyme of this his examynacion, and whervnto thexaminer of this Corte hath subscribed his Name to the page 81 ys the very same book wherein the parcells of stuffe aforesayd, delyuered to & for the def^{t}, were sett downe & wch the sayd def.^{t} Beeston perused and allowed of as abouesayd, wch sayd book was (to the best vnderstandinge of this dep^{t} & for any thinge he cann obserue in yt to the contrary) when the def.^{t} perused & allowed therof: the very same yt now ys concerninge the seuerall parcells of stuffes aforesayd, wch he this dep^{t} the rath^{r} beleyueth & knoweth so to be for that his name ys subscribed in the sayd book, to the foote of thaccompt agreed vppon when the sayd beeston & the Compl^{t}, in the presence & hearinge of this dep.^{t} And more or otherwyse to this Inter this dep^{t} sayth he can not depose/

Thomas Somerscales

William ffreshwat^{er} of the parysh of St Butttulphes wthout byshoppes gate London merchant Taylo^{r} of thage of lxxij yeares or theraboutes sworne and produced to be examined vppon the 1–2. & 3. Inter. deposeth and sayth./

1 To the first Inter this dep^{t} sayth he well knoweth both the parties pl^{t} and def.^{t}

2 To the second Inter this dep^{t} sayth that the def.^{t} Christoph^{er} Beeston, abought the tyme menconed in thinterrogatory, vizt in or about the yeare of o^{r} Lord god 1612. did bargen for and bye certen parcells of stuffes as tynsell loome workes & such lyke of the comp^{lt} and did then request the comp^{lt} that If any the company or workemen belonginge to the play^{ers} at the Redd bull in St John Street did come of those stuffes he had bought of the Compl^{t}, or of any more or oth^{er} stuffe, for the vse of the sayd Company, that he the Compl^{t} shold delyuer them from tyme to tyme wch he the sayd Beeston the def^{t} then promysed to see discharged & payed for.

3 To the 3 Inter this dept^{t} sayeth that the def.^{t} Beeston did vndertake for such wares & stuffes as were delyuered by the pl.^{t} vnto the sayd Company of play.^{ers} in A.° 1612. & so afterwards vnto

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& in the yeare of o^r^ Lord 1616, And further this dep^t^ sayth y^t^ the sd stuffes wch were in that tyme delyuered by the Compl^t^ vnto the sayd Company or for their vse were from tyme to tyme delyuered to this dep^t^ & oth^ers^ in Beestons name and by his direccion & appoyntm^t^, And that this dep^t^ sayth he knoweth yt so to bee for y^t^ he hym selfe beeinge a workman to the sd company hath often & diuerse tymes gone to the pl^tes^ house, some tymes by direccon from the sayd Beeston & some tymes as sent by oth^ers^ of the sayd Company, for diuerse stuffes, wch they had occasion to vse. And when he hath asked the pl.^t^ for the stuffes he was so sent for, the pl^t^ often tymes refused to delyuer the same to this dep^t^, w^th^out some token from the sayd Beeston, whervppon this dep^t^ hath diuerse tymes gone backe agayne w^th^out the stuffes to the sayd Beeston, and then the sd Beeston hath sent this dep^t^ agayn, some tymes by some token & some tymes hath sent wth hym this dep^t^ one or oth^er^ belonginge to the sd company for the thinges aforesayd, and then the pl.^t^ hath delyuered the sayd stuffes from tyme to tyme to this dep^t^ to thuse of the sayd Beeston & his company. And more to this Inter he sayth he can not depose

Wm ffreshwaters.

Japhathe Weale of the parishe of Christchurch in Newgate market London habberdasher of thage of 39 yeares or thereabouts sworne and examyned vppon the first sixt seaventh & nynthe Interr deposeth & saythe/

1. To the ffirst Interr this deponnent saythe he knowethe the parties plaintiffes & defendt./
6. To the sixt Interr this deponnent saithe he knowethe and was present when the defendt Beasten perused *the* plaintiffs booke of parcells wherein the parcells of stuffe weare expressed that weare deliuered to the defendt & to his vse, and he soe perused the same booke in Ao. dni 1618. to the best Rememberance of this deponent; And saythe the parcells of stuffes soe perused by the defendt in the pltes booke did to the best Rememberance of this deponent amount to the some xlvj^li^ or thereabouts; and saythe

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that when the sd defendt soe perused the sd. booke he did acknowledge the Receipt of the said parcells and allowe of the rates and prizes as theye weare there sett downe in the said booke/ And after he the defendt hadd soe perused the sd booke and acknowledged the Reciept of the sd parcells and allowed of the prises as they weare sett downe in the sd booke he desired the Complt to haue patience for a while & he should haue his mony or wordes to that effect/ And more he Cannot depose to this Interr/

7. To the seaventh Interr this deponent saithe that the booke of parcell[s] nowe shewed vnto him this deponnent at the tyme of this his examynacion & wherevnto thexamyner of this Cort hathe subscribed his name is the same booke that the deft soe perused & allowede of the sd parcells and that the same booke is wthout any alteracion concerninge that poynte since the sd defendt perused the same/ And more he Cannot depose to this Interr./

9. To the nynth Interr this deponent saythe/ he knowethe that the defendt since the perusall of the booke as aforesd towardes the foote of that accompt made paymt of the some of 36li vnto the Complt in part of payment of such some & somes of mony as was due vnto the Complt vppon the foresaid booke; and noe more was payd to the sd Complainant or his servante or servantes to his vse since to the knowledge of this deponent And more he Cannot deponent, [*sic*] depose./ to this Interr

Japheth Weale

John Kinge of London gent of thage of fortie six yeares or thereaboutes sworne & produced to be examyned vppon the first, second, fourthe & sixte Interr the daye & yeare abouesd deposethe and saithe/

1. To the first Interr this deponn saithe he knowethe the parties pltfes and defendt/

2. To the second Interr this deponnent saithe/ he knowethe that the defendt in or aboute the yeare of or Lord god *1612.* did Request the Complt Smythe to deliuer from tyme to tyme vnto the Company of players for the tyme then beinge at the Redd Bull in St

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John Streete, such p*ar*cells of Tynsell stuffes & other stuffes as the sd Company should vse in playinge and vndertooke to see him the Complaynant payd for the same, wch he knowethe to be true for that the Comp^lt^ would not deliu*er* any stuffes vnto any of the sd Company of players except they brought a tokne from the defendt Beeston./

4. To the fourthe Interr this deponn*ent* saithe that the sd Company gaue Allowance vnto the defendt Beeston for the satisfying of such mony as should be due to the Comp^lt^ for such stuffes; and saythe that the sd Company did allowe him the sd Beeston one half of the proffitt that came of the gallyryes; towards the satisfyinge of the Comp^ltes^ debt wch he Received weekly accordingly but what it might amount vnto this deponent Cannot iudge, neither knowethe he aboute what tyme the sd Company gaue the defendt such allowance And more he Cannot depose to this Interr/

5. To the fifte Interr this deponent saithe that after the p^lt^ begann to deliu^er^ Stuffes vnto the sd Company the sd Company Contynued together for the space of eight or nyne yeares or thereabout*es*, and saithe that they the sd Company begann to sep*ar*ate them selues, three yeares since or there about*es*; and at the sep*ar*acion of the sd Company the sayd Beeston did take and Carry Away all the apparrell that was then amongst the sd Company and Converted them to his owne vse/ and since disposed of them to other Companyes at his pleasure And more to this Interr he cannot depose saue that he saythe that the stuffes bought of the p^lt^ weare all worne out & consumed before the sep*ar*acon of the Company aforesd./

Jhum
King

Decrees and Orders, 17–18 James I, Vol 30, p. 324.

xxvj^to^ Die Maij a° &c 18° et 53°/

Smith
Beeston In the cause at the sute of Iohn Smith compl^t^ against Xpofer Beeston and others Def^tes^ vpon mocion made to this court on the behalf of the said compl^t^ y^t^ is ordered that the same matter shalbe

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published vpon the second day of the next terme & heard in this court vpon theight day of the same terme if the said def^tes^ having convenyent notice of this order before the sayd day of publicacion shall not then or in the meane tyme shewe good matter in this court to the contrary–/

Affidavit Book, 15–19 James I, Miscellaneous Books 130. [Not paged, and badly damaged.]

Termino Trinit A° R Regis Iacobi Anglie ffrantie et Hibernie xviij° et Scotie liij°./ viz

xvj° die Junij A° praedc./

Smith Beeston Towching the cause at the sute of Iohn Smith plaintif against Xpofer Beeston gent & others def^tes^. The said Xpofer Beeston maketh othe that Emanuell Reade gent is one of this deponentes most materiall witnesses in this cause who about three weekes past went into Ireland, whose returne is not expected till some tyme in Michaelmas terme next-//

Decrees and Orders, 17–18 Jas I, Vol. 30, p. 428.

xvij° die Junij A° &c 18° et 53°–/

Smith Beeston In the cause at the sute of Iohn Smith compl^t^ against xpofer Beeston def^t^, vpon the mocion of m^r^ Jeffrey of counsaill wth the said def^t^ yt is ordered (any former order notw^th^standing) in regard of the def^tes^ Affidavit that the publicacion of this cause shalbe deferred vntill crastino animarum next and the hearing thereof vntill the xij^th^ day of novemb^r^ next, And at those dayes the same matter shalbe published & heard peremptorily-/

Affidavit Book, 15–19 James I, Miscellaneous Books, 130. [Not paged, and badly damaged.]

Affidavit of Elizabeth Perkins.

xxvij° die Junij A° &c 18° et 53°/

Smith Beeston Towching the cause at the sute of John Smith pl against xpofer Beeston def^t^, Elizabeth Perkins (wief of Richard Perkins of

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the parish of Clarkinwell gent) maketh othe that Emanuell Reade hath made his abode in Jreland by the space of two or three yeares last past or theareabout*es* with his wief & familie and about Easter last did come into England and did lye often tymes in the howse of the said xpofer Beeston & was much in his company whilest he was in England And about Whitsontyde last the saide Emanuell Reade went againe into Jreland & at his depa*r*ture he sayde that he thought he should never returne agayne into England

[*In eodem.*] *Affidavit of John Smith.*

T*ermi*no sci Michis A° R R*egis* Iacobi Anglie ffrantie et hibnie 18° et Scotie liij°

Quarto die Novembris A° p*rae*dc.

Smith Beeston Towching the cause at the sute of John Smith pl against xpofer Beeston def^{t}: The said John Smith maketh othe that Xpofer Beeston and this Depon^{t} having some conference together about Mich*aelm*as terme 1619 concerning the putting in of Beestons answer the sayd Beeston did then say that it was nothing for him to put in a false answere into this Court of Reques*tes,* for that it was not punishable, And this deponent made him answere againe that if the lawe would punish him for it he should be punished —/—/

[*In eodem.*] *Affidavit of John Smith.*

xiij° Die Novembris A° p*rae*dc/

Smith Beeston Towching the cause at the sute of John Smith pl against xpofer Biston def^{t}: The said compl^{t} deposeth that about Midsomer 1619 this depon^{t} came to the said Biston to demaund his debt, And the said Biston sayde that he would pay his p*ar*t, & desyred this depon^{t} to demaund the rest of the companie wch to satisfy him, this Depon^{t} did. But their answere was they ought him this compl^{t} nothing But the said Biston was to pay him Then this compl^{t} tolde the said Biston their answere and sayde he would profer his bill in this ho: Court that both Biston and the companie might answere vpon theire othes wch of them ought to

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pay this compl[t] And the said Biston & the company were both contented & requested this compl[t] to take the sayd course—/

IV.

THE FORTUNE THEATRE AND THE BEAR GARDEN.

The part played by the Fortune theatre and the Bear Garden in the evolution of the drama of Shakespeare's time cannot properly be told until we are in possession of all available data. The chief items formerly known, besides not a little new matter, I have presented in *University Studies* for April–July, 1908, as incidental to the treatment of *The Children of the Chapel at Blackfriars 1597–1603*. Old materials and new must ultimately be gathered together and presented, not as mere isolated facts, but as essential members of a living, palpitating organism. But it is my purpose now to do no more than add certain new facts that will finally fall into their proper relations in later presentations of other literary historians as well as my own. It has long been known that Edward Alleyn, within a year after he built the Fortune, leased one half of it to his father-in-law, Philip Henslowe. The lease bore date 4 April, 1601, and was to continue twenty-four years at an annual rental of 8*l.* An unexecuted assignment of it, after Philip Henslowe's death, in 1616 by Agnes Henslowe, his wife and executrix, is now preserved among the voluminous papers of Alleyn and Henslowe at the college founded by Alleyn at Dulwich. The papers there preserved furnish us some of our most valuable information on the Elizabethan-Jacobean drama and stage. But among them the lease itself has not been found, nor any record of payments of rent from time to time by Henslowe to Alleyn for the Fortune.

It is evident from the documents I now present that no payments in money were made by Henslowe for the rent of one half of the Fortune. It was simply offset by rent of other property to Alleyn. It is here stated that an agreement was made in or about 1610 whereby Alleyn released Henslowe from payment of the 8*l.* in consideration of Hens-

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lowe's allowing Alleyn residence at the Bear Garden in Southwark. But there can be little doubt that the payment of rent had been similarly offset from the very beginning of the lease in 1601.

The suggestions in the document concerning unknown features of the Bear Garden, Alleyn's long residence there, and the later relations to William Henslowe, brother and part legatee of Philip, may turn out to be more than merely interesting. I choose to present at present only this one out of a series of documents relating to the same persons and theatres. All emit an occasional glimmer of light, and in due course shall be published.

ALLEYN VS. HENSLOWE.

Court of Requests Proceedings, uncalendered, James I. [1624.]

ALLEYN'S BILL.

[Bill only. Crumpled and stained, but legible.]

[Date of filing, *in dorso*] xxxj° die Januarij Anno Rni *Regis* Iacobi [Angl] fr et hibnie xxj°, et Scotie lvij

Defend vocet^r *per* nunc Camer

To the Kinges most excellent
Matie

In most humble wise Complayninge sheweth to your most excellent Matie your trewe ffaithfull and obedient subiecte and servaunt Edward Allen of Dullwich in your highenesse Countie of Surrey Esquire. That wheare as in or aboute the eight yeare of your Ma^tes most happie and prosperouse raigne over this your highenesse Realme of England theare was Covenaunt Contract Conclusion and agreement made betweene one Phillippe Henslowe late whiles hee lived of the parish of St Saviours in the said Countie of Surrey Esquire deceased and your subiecte that one yearelie rent of eighte poundes dewe and payeable to your subiecte his executors and assigns by the said Phillipp Henslowe for the tearme of ffoure and Twentie yeares then to come and yett vnexpired for the moyetie of a house Comonlie Called the

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ffortune Playehouse and other tenement*es* theareunto adioyninge scituate and beinge in Goldinge Lane in the County of Midd*lesex* should from thence be released and dischardged by your said subt to the said Phillipp Henslowe his executors and assignes, wch rent of eighte pound*es* p*er* ann*um* your sub*iec*te did accordinglie release to the said Phillippe Henslowe in his liffe tyme and did ffree and acquite him his executors and assignes from the payement thearof, and for Consideracion hearof the said Phillippe Henslowe did Covenaunt and agree wth your said sub*iec*te that hee the said Phillippe Henslowe his executors and assignes that your said sub*iec*te or his assignes wth ffoure servaunts should or might haue the vse or occupation of a Certaine messuage or tenement whearin your said sub*iec*te then dwelt beinge parcell of a messuage or tenement Comonlie Called the Beare garden and the newe building*es* then latelie built before the same scituate and beinge in the parish of St Saviours in Southwarke aforesaid for your sub*iec*te his assignes or servaunt*es* necessarie or Convenient Lodginge wth the vse of the kitchen of the same messuage or ten*ement* for dressinge of his or theire meate washinge or other necessarries wth ingresse, egresse and regresse into and from the same att his or theire wills and pleasure duringe the rest and residewe of the said tearme of ffoure and twentie yeares then to comme and vnexpired wthout anie rent or other recompence to be yealded or payed for the same other then the release and dischardge of the said yearelie rent of eighte pound*es* payeable to your subte by the said Phillipp Henslowe as is aforesaid and wthout the lett disturbaunce molestation, expulsion eviccion or interrupcion of the said Phillippe Henslowe his executors or assignes or of anie other p*er*son or p*er*sons by his or theire meanes, mighte, Title, estate, interest, Consent or procurement, And your sub*iec*te did accordinglie hold and enioye the said messuage or ten*ement* whearin your sub*iec*te then dwelt and the vse of the said kitchen quietlie and ffreelie duringe all the liffe tyme of the said Phillipp Henslowe wch was about ffive yeares after wthout yealdinge or payeinge anie rent for the same to the said Phillipp Henslowe other then the release and dischardge of the said yearlie rent of eight pound*es* to the

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said Phillippe Henslowe his executors and assignes, And afterwar*des* (that is to saye) in or aboute the sixth daye of Januarie in the thirteenth yeare of your Ma^tes^ said raigne the said Phillipp Henslowe did make his last will and testament in wrytinge and theareby did bequeathe or devise the interest of such land*es* and lease wch hee had and helde vnder the Bishopp of Winchester and the tearme of yeares thearin to Com*me* to one William Henslowe brother of the said Phillipp Henslowe, the said messuage or Tenement whearin your sub*iec*te dwelt as aforesaid and the said kitchen beinge p*ar*cell of the said land*es* wch the said Phillipp Henslowe did then hold by lease vnder the said Bishopp of Winchester, and which the said Phillipp Henslowe did geve and bequeathe to the said William Henslowe as aforesaid, And the said Phillipp Henslowe shortlie after in the said moneth of Januarie in the said thirteenth yeare of your ma^tes^ said raigne dyed theare beinge then aboute ffiftie yeares vnexpired of the said lease, wheareby the said Phillipp Henslowe did hold the said land*es* vnder the Bishopp of Winchester, And the said William Henslowe by vertue of the said guifte and bequest made vnto him of the same land*es* by the last will and testament of the said Phillipp Henslowe did enter into and possesse himselfe of the same land*es* wheareby hee allsoe was and is possessed of the said messuage or tenement whearin your sub*iec*te dwelt and of the said kitchen and doth receive and hath received the rent*es* issues and profitt*es* thearof ever sithence the death of the said Phillipp Henslowe But nowe soe it is maye it please your most excellent Matie that the said William Henslowe doth very vniustlie and Contrarie to all equitie and good conscience deteyne and hath deteyned ever sithence the death of the said Phillippe Henslowe from your said sub*iec*te vnder Collour of the said guifte or bequest made vnto him by the said Phillipp Henslowe the said messuage or Tenement whearin your sub*iec*te dwelt as aforesaid and the vse of the said kitchen the said Tearme of ffoure and Twentie yeares beinge yett vnexpired and not determined w^thout^ anie allowaunce or recompence made or geven to your Sub*iec*te for the same and doth allso vtterlie refuse and denie to geve your said sub*iec*te

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anie allowaunce or recompence for the same Notw^th^standinge that the said William Henslowe doth well knowe that the said Phillipp Henslowe for the Consideracion aforesaid did Covenaunt Conclude and agree wth your said subiecte that your subiect and his assignes wth ffoure servauntes should or might haue the vse and occupation thearof in manner aforesaide duringe the rest and residewe of the said tearme of ffoure and twentie yeares then to comme and vnexpired. Nowe for that your said subiecte hath noe meanes by the stricte Course of the Common Lawes of this Realme to recover the possession of the said messuage or Tenement whearin your subiecte dwelt and the vse of the said kitchen or the rentes issues or proffittes thearof ever sithence the death of the said Phillipp Henslowe, and doubteth not but that the said William Henslowe will sett fforth vppon his oath the saide Conclusion and agreement made betweene your said subiecte and the said Phillippe Henslowe. Maye it thearefore please your most excellent Matie to graunte to your saide subiecte your Maiesties most gratiouse writt of privie seale to be dyrected to him the said William Henslowe Commaundinge him theareby personallie to be and appeare before your Matie and your Ma^tes^ Councell in your Ma^tes^ Chamber of Whitehall att Westminster then and theare to aunsweare the premisses vppon his oathe, and to stand to such order and Censure thearin as to your Ma^tes^ said Councell shalbee thought meete and Convenient, And your subiecte as dewtie bindes him shall ever praye for your Ma^tes^ most happie and prosperouse raigne longe to Continewe over vs /

Ro: Gosson

Affidavit Book, 21 & 22 James I, Misc. Books 132.

Termino sancti Hillarij A° R Regis Jacobi Anglie ffr: et hibernie xxj° et Scotie lvij°–/

Quinto die ffebruarij a° &c 21° et 57°./

Allen Henslowe Towching the cause at the sute of Edward Allen esq^r^ plaintiff against Willm Henslowe def^t^ Thomas Mowseherst of Maresfeild in the county of Sussex yeoman aged lvj yeares or theareaboutes

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maketh othe, that the sayd def^{t} Willm Henslowe is an aged man, about the age of three-score and eight yeares, and hath been sick ever sithence the feast of St Bartholomewe last past & seavenight before vntill this p*re*sent tyme, & yet is very sick & weake & keepeth his bed not able to helpe himself, And that the said def^{t} by reason of his long sicknes is become deafe, & his sences & vnderstanding so decayed that he cannot well heare nor vnderstand the said compl^{tes} bill (being read vnto him) to make answere therevnto.—//

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The English Lyric: A Study in Psycho-Genesis

BY HARTLEY BURR ALEXANDER

I. ETHNIC CHARACTER

The mental complexion of a race, no less than that of an individual, is most characteristically mirrored in its artistic achievement. Throughout the history of civilization what has given tone and quality to every effective culture has been, more than all else, its art. The aesthetic impression produced by a race and its works is always lasting indication of its vital force.

Nowadays when we think of Greek civilization the image first to present itself is of urns and vases of graceful line, or of wonderful marble statuary, or of fine-limned temples gleaming white above the blue waters of the Aegean. Always it is some beauty of plastic form, luminous, exquisite, less a thrilling of the imagination than a rest in radiant charm. Contrast with this the culture of Italy. The Renaissance! Our one overmastering estimate of the Italian race is determined by that period of its history in which it developed an habiliment of sensuous splendor for its ideas and its ideals such as has never been attained by any other people. Its mere wealth of color and tone stimulate the imagination to undreamt vision. The spirit of it, also, is in part revealed to us, and this because we are not wholly alien to the ideals it was concerned in expressing. The Renaissance was Italian in its sensuous magnificence, but its motives were European, Occidental, and so not out of sympathy with our own. Understanding is, indeed, quite as essential to aesthetic appreciation as is stimulation of sense through beauties of color and form. Oriental civilizations seem all more or less foreign and unnatural to us. Though here, as with the more intimately com-

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prehended Greek and Italian cultures, it is the aesthetic aspect that most vividly impresses us, still the impression is not so vital nor so close. There is richness and sensuous variety in Oriental culture not unlike that of the Italian, but it does not appeal to us with the same pertinence. We do not comprehend a cast of mind so thoroughly alien in vision; we cannot touch the human motive that actuates its expression; the psychical reality, the ideal, which is the reason and worth of the creation, is hidden from us, and we have no art to read the mind's complexion in features not transfigured by the sympathy that springs from community of culture.

Now just as we understand other peoples best through their artistic expression, so may we best understand ourselves in our own aesthetic tastes and achievements. To be sure, we, as all modern peoples, have borrowed freely from the cultures that have historically anteceded ours, and consequently there are many elements and influences in our work which represent an assimilated and not a native taste. Nevertheless these are mainly superficial, having to do with form rather than spirit,—which not the most imitative art can wholly conceal. No matter what one race learns from another, its work is bound to be imbued with a turn and temper native to the flesh; and where this is perceived, therein is discovered the portraiture of the art.

Ethnologists tell us that the English people is the product of a highly complex fusion of races. An understratum of Iberian blood; an infusion of Celt; and out of the two the Briton of the era of the Roman occupation. Later the Teutons,—Angles, Saxons, Norwegians, Danes, Normans. From all these arises the modern Britisher and British-American, quite inappropriately called Anglo-Saxon. But however great the variety of races, the time of first fusion is now so long passed that a thoroughly characteristic type has been developed. It is Teuto-Celtic rather than Anglo-Saxon; for in the modern Briton are united two distinctive trends of character and temperament probably not wrongly accredited to a Teutonic and a Celtic element (if Caesar's Briton was indeed a Celt). The two strains may be clearly distinguished, and they are important factors in any

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understanding of British psychology. Yet they do not represent two types of individual, for their fusion has produced a new and distinct personality having temper and tone not difficult to recognize nor wrongly to be accounted unitary.

For seeing what that temper is, because it is so common to us, we may best contrast it with types that strike us by reason of their divergence from it. The Italian mind we conceive to be richly and vividly sensuous, delighting in color and sound and all the joyous stimulation of a brilliant vitality. The Gallic mind we think of as keenly logical and quick, dramatic in all the stagings of its thought, clear-bounded even in emotion. The German we take to be ponderously profound, studiously careful, tenderly sentimental. But our own mind shares with none of these. Compared with them, we find its most striking feature is its repression. It is dumb even to itself, slow to understand itself, and when it does understand, however stubborn in conviction, it is never facile in expression. The repression is thus not a stoical reticence, and it is far less willed than imposed by nature. In common with all mankind we desire self-expression, but it is only attained by us with labor; we never quite conquer the awkward age. Hence our admiration for the to us difficult art of oratory—so spontaneously the gift of the gesticulating Latin,—and hence, too, our failure to comprehend the somewhat pluvious emotion of the German.

But in the mere fact of repression we have only a negative and barren characteristic. Our interest probes deeper. We know, for example, that we possess natively a full portion of Northern gloom of mind, an oppression under destiny which impels us to take even joys sadly. In half antithesis to this, we recognize an almost exuberant practical idealism, the spirit which can exalt the average human life to highest worth,—as in the democracy we believe in, and aspire to, and by reason of a magnificent faith partially attain. Other qualities and other features we know, too, but this struggle of idealistic faith with the anciently destined sorrow of our mood is perhaps most fundamental. That it is tight-pent, because of our natural repression, renders the struggle more intense and at the same time gives the

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characteristic quality to our expression, when expression is vouchsafed us. Strongly metaphorical because the half-truth of metaphor conveys the confusion as well as the strength of the high-wrought mood; spontaneous and brief because of the turbulence within the pent source: these are the natural qualities of our most native expression, and it is perhaps needless to say that they are essentially characteristics of lyrical expression. At least, in a type of mind conceptually rather than sensuously imaginative,—which will therefore give its art a literary form,—these qualities demand the lyric; and with due deference to Shakespeare and Elizabethan drama, it appears to me certain that it is just in our lyric literature that the most genuine embodiment of English character and genius is to be found.

II. POETIC MODE

Race and culture (and in culture I include all that grows out of language and tradition) furnish medium and background of poetic expression. They enrich the poet's personality, his character and experience; they supply him with an audience of kindred understanding; they enable fullness and surety of utterance arising from the reflection of his life and mood in the larger life of his people. Individuality thus comes to mean a fine precipitation of what marks the essential character of race or culture: in mood it is an acute delicacy of response to underweaving instincts; in expression it is a lively mirroring of cultural shadow and tone. The quality of expression to which in these guises it gives occasion Matthew Arnold called *mode,*—thereby indicating a something more than manner though less than mood, something partly of the nature of method but instinctive and fixed in the blood.

In that noteworthy essay on *The Study of Celtic Literature,* Arnold distinguishes three modes of English poetry which he ascribes to three cultural sources, two native to the race and one appropriated from without. The native modes are a Celtic and a Saxon, the one appropriated is the classical.

First, though our author assigns to it last appearance in our

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literature and the least fundamental character, let us consider what he calls the Greek "luminous" mode. Its salient qualities are startling clearness of profile, bell-like purity of tone, a lambent sunniness of atmosphere, and in sentiment a delicate expressiveness most lovely because so utterly free from introspection and its attendant modesties. In illustration Arnold cites Theocritus:

λειμὼν γάρ σφιν ἔκειτο μέγας, στιβάδεσσιν ὄνειαρ.[1]

With which he might well have set the exquisite fragment from Sappho's description of the garden of the nymphs, wherein is centered all the drowse and dream of the *Lotos-Eaters:*

ἀμφὶ δέ ψῦχρον κελάδει δι' ὔσδων
μαλίνων, αἰθυσσομένων δὲ φύλλων
κῶμα κατάρρει —

which John Addington Symonds translates:

All around through branches of apple-orchards
Cool streams call, while down from the leaves atremble
Slumber distilleth.

From the English he cites Oberon's description of Titania's couch:

I know a bank where the wild thyme blows,
Where oxlips and the nodding violet grows,
Quite over-canopied with luscious woodbine,
With sweet musk-roses and with eglantine.

And again, Keats:

What little town, by river or seashore,
Or mountain-built with quiet citadel,
Is emptied of its folk this pious morn?

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[1] *Idylls,* XIII, 34. So cited by Arnold. Paley and other editors read the verse

λειμὼν γάρ σφιν ἔκειτο, μέγα στιβάδεσσιν ὄνειαρ

—"for they found a meadow lying, rich in couches of strown grass and leaves" (Lang).

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In all of these examples we can clearly grasp the impulsive delight in mere perception which, transfiguring the object of perception, gives rise to the luminous quality. And most appropriately is it likened to light: it is imaginative illumination. But I think, rather than merely classical, the mode is elemental in all poetry. In quality it is nearest akin to child imagination,—eager, active, snared in the filmiest web of sunshine, ever discovering new wonder in what to the tired mind of maturity is only the commonplace.

We find it pervading children's poetry and we find it in primitive song everywhere. Lafcadio Hearn has given us dainty bits from the poetry of old Japan quite rivaling the Greek.[2] Thus in comparing Japanese and Greek appreciation of the poetry of insect life, with the beautiful lines of Meleager,

> O cricket, the soother of slumber . . . weaving the thread of a voice that causes love to wander away! . . .

and,

> Thou vocal tettix, drunk with drops of dew, sitting with thy serrated limbs upon the tops of petals, thou givest out the melody of the lyre from thy dusky skin. . .

—with these, Hearn may justly set for nicety of observation and delicacy of sentiment this on the *aburazémi* (a variety of cicada),

> Speaking with that voice,
> Has the dew taken life? . . .
> Only the aburazémi!

And in,

> Fathomless deepens the heat: the ceaseless shrilling of sémi
> Mounts, like a hissing fire, up to the motionless clounds. . .

Hearn gives us a startling parallel to the Alcaean fragment on the cicada preserved to us by Demetrius:

> From beneath his wings a shrilling song he pours—
> High fluting that to fiery heights upsoars.

[2] *Shadowings,* 1900.

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In the song from the province of Iwami, the song of a lover seeking the trysting-place, a more romantic note is struck:

> Ah, the darling! . . .
> Ever as I steal along the ricefield path
> The firefly kindles a light to show me the way . . .

And even this, with its flavor of conceit, may perhaps bear comparison with the nobler conceit of the epigram ascribed to Aristocles, the son of Ariston, before he became known as the Plato who would banish poets and poesy from his City of the Wise:

> ἀστέρας εἰσαθρεῖς, ἀστὴρ ἐμός· εἴθε γενοίμην
> οὐρανός, ὡς πολλοῖς ὄμμασιν εἰς σὲ βλέπω—

which in English runs naturally into a little sibilant song:

> Thou gazest on the stars, my star? . . .
> And 'tis O that I might be
> Yon starry skies
> With myriad eyes
> To gaze on thee!

In Greece and in Japan we find the same primordial pleased amaze that a world could be so fair; and if the classic peoples preserved it undefiled into the highest culture, keeping always in the "white light," as Professor Woodberry puts it, this was rather because of the exceptional sun-delight of their natural domain than because the mode was exclusive possession of their race. It was in English poetry long before the Renaissance. Plus a humorously genial insight into men and affairs it is the chief poetical asset of Chaucer; and every poet, no matter to what agonies of introspection or grimness of message he may later attain, must first have possessed as his poetic birthright this divine child-joy.

But if the luminous mode nourishes the root of poetic aspiration, it by no means determines the form and fashion of the flower. There are all-important conditions of environment, of racial predilection, of education and the mould of natural circumstance. The poetry of the Japanese is not, after all, that of the Greek: Fuji-yama and Buddha demand oracles other than

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Dodona and Delphi; the rude ballad of Robin Hood's Alan a Dale is only remotely akin to the courtly romaunt of Coeur de Lion's Blondel; and ever there has been one song echoed from mountain and mist, quite another from green dale and blossoming hedgerow.

The clear-seeing eyes of the poet find the fundamental tone of poetic composition everywhere but atmosphere and perspective follow environment and age-old heredities. All true poetry is luminous, but the scenes that are shot with light vary indefinitely. Some are almost trans-sensibly perspicuous,—and this is the classical, the Mediterranean mode; some are revealed through intermittent and blinding flashes, scenes of cosmic indefiniteness and awe,—and this is the Teutonic, the Northern mode; some are perpetually ashimer with the mystic "light that never was on land or sea,"—and this is the mode of the Celts of the ultimate West.

Yet each of these—Greek, Saxon, Celtic,—develops from the same Aryan heredity. The studies of the past quarter-century have penetrated far into the depths of that old racial mind—pre-Hellenic, pre-Teutonic, pre-Celtic,—the mind of primitive Europe whence the European civilizations have been unfolded. In this old mind we meet that common fond of ideas and ways of seeing what we call our world which is the basis of the unity of European thought as we know it today. The picture we have of this mind, reconstructed from the debris of folklore and from slow-dissolving custom and speech, is lurid rather than attractive; for it is mainly a murk of ghost-ridden superstition, with its grim attendance of human sacrifice and half-remembered cannibalism, this and the hardly less gruesome and fierce ritual of a spirit of the corn to whom man's blood must be yearly rendered up in return for the yearly dole of food. Placation of the hovering and vengeful souls of the human dead and compensation, life for life, to the great Earth Mother of us all, who must devour that she may feed,—these are the primal dogmas of old Europe, living-dead in us yet; and it is out of these that is sprung that curious mélange of ideas of shape-shifting men and talking beasts,

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of daemons of earth and air and sea, of giants and Titans and the wars of gods and men, which are the substance and life of our folktales;—aye, and it is out of these that sprung, half by miracle, the vision of an immortal life, and of a destiny-conquering man.

And with the wild phantasy of these beliefs we have to reckon in any account we may give of the spiritual development forthshown in any European literature. We have to reckon with it . . . but rather as the background, the ***hinterland*** of the forward thought, than as its determinant. It is a background that is valuable, first, as a ground of comparison for the different modes that have developed upon it, and second, as the secret and spring of that like-mindedness which enables Europeans of diverse culture-traditions to comprehend and sympathize with one another. As, for example, it is great profit to compare what is made of the idea of Fate by Hellene and Teuton respectively, the Nemesis of the one a moral principle, Righteous Indignation, the Wyrd of the other a Valkyrie-like Snatcher of Souls, implacable, wrathful; or, again, to contrast the clodlike Jotunn of the Northman or the malignant man-devouring Fomor of the Gael with the Titan of the brighter myth of the South, the Titan who may be a Prometheus and a champion of mankind, his Earth-born kin.

Against the murk background, what we must seek in each is the distinctive light which each race develops in its own habitation.

III. THE GREEK MODE

Let us once again consider this "luminous" Hellenic mode which plays so profound a rôle in the development of all European literature.

"The 'serene and classical' Greek of Winckelmann and Goethe," says Gilbert Murray, "did good service to the world in his day, though we now feel him to be mainly a phantom. He has been succeeded, especially in the works of painters and poets, by an aesthetic and fleshly Greek in fine raiment, an abstract Pagan who lives to be contrasted with an equally abstract early Christian or Puritan, and to be glorified or mishandled accord-

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ing to the sentiments of his critic. He is a phantom, too, as unreal as those marble palaces in which he habitually takes his ease. . . . There is more flesh and blood in the Greek of the anthropologist, the foster-brother of Kaffirs and Hairy Ainos. He is at least human and simple and emotional, and free from irrelevant trappings. His fault, of course, is that he is not the man we want, but only the raw material out of which that man was formed: a Hellene without the beauty, without the spiritual life, without the Hellenism."

The "raw material out of which the man was formed" is much the same for Greek and Saxon and Celt, yet each of these is formed, and formed into his own kind of man in a unique and individual sense.

And what, then, is the uniqueness of the Hellene? or, to put the question in a less ambitious and more apposite form, what is the distinctive quality of the Hellenic mode, the classical spirit, in literature? We have dissented from Arnold's dictum that it is mere light, mere luminousness,—rather it is a special degree of light, steady and pervasive like the light of day, restricted in its avoidance of the prismatic play of shadows, the still and constant "white light" of Professor Woodberry.

In her brilliant *Prolegomena to the Study of Greek Religion* Jane Harrison forcefully brings home "the fact that Greek religion for all its superficial serenity had within it and beneath it elements of a darker and deeper significance"—pallor and trembling in the presence of dark underworld powers and that sickness of soul which arises invisibly from the miasma of superstition. Behind the brilliant cults of the civic gods and goddesses—Wardens and Warriors of the Hellenic states,—hung a sombre array of Chthonian deities, whose rites were done at night in caves and dens, the one wish of the worshippers being to avert the malignancy of powers ever unconquered though ever held suppressed.

In Greek literature there is little explicit reference to this suppressed chapter of mythology,—a chapter having to do with mysteries and obscure rites and things only darkly to be hinted. On the surface are the bright and friendly Olympians, with Zeus,

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the shining heaven, lording it over all,—daylight and zestful action everywhere. We may surmise dim genealogies of monster deities from the picturesque Sileni and Satyri whose final function is but to emphasize the wholesome humanity of the regnant gods; but the grim and raw reality of their being is rigorously repressed.

The sociableness, the intense humanness of Greek religion is thus due to the fact that it is, in its palpable aspects, an *expurgated* religion; and, with no less truth, that brightness which makes Greek literature the model of humanism is due to the fact that it is spiritually an expurgated literature: the darker, the more monstrous, the more distempered phases of experience are eliminated as by an instinct more careful than care; so that we gather from it an impression only of lambent and generous sunlight.

This is our first impression, but we have to acknowledge too a sense of power—elastic as in Homer, terse and willful as in Aeschylus, broad and gracious as in Plato. And a momentary reflection tells us that this powerfulness of the literature is due to the same cause as its impression of light: to the fact of *repression*. We feel the substructure implicit in the revealed thought; we keep only in the "white light" but we are never left without some consciousness of Cimmerian shades, of the cosmic envelop of the soul.

Art and conduct, ethics and aesthetics, are only two manners of manifesting the same under-dominating character. And if we look into Greek ethics we find at once the parallel to this power-through-repression which is manifested in the literary, as indeed in all Greek art. The clue to it is to be found in the conception of virtue, *ἀρετή*, which Aristotle defined as a mean, a mean relative to ourselves, as human beings gifted with judgment and choice, avoiding on the one hand the distemper of passion, on the other the spiritual malformation of ascetic denial. The ready maxim, *μηδὲν ἄγαν* 'Nothing too much,' and the ever-praised *σωφροσύνη*, 'Temperance,' show how much the Greeks feared excess, how ardently they admired restraint, in the conduct of men; and no less is this shown in their constant dread of *ὕβρις*, that insolence of mortal pride which is the very essence of impiety.

"The things of mortals best befit mortality," sang Pindar; and

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Protagoras proclaiming "Man is the measure of all" but gives us the obverse inscription, diminishing the world to mortal compass rather than expanding the human to the Titanic.

And so we get, through restraint and repression and the mastery of self which these imply, that intense concern for "the things of mortals" which has crowned with radiance the lyrics of the Hellenes and given to their drama its immortal poignancy. *Light* and *power:* and the light is the light of a wholly human love for things human; and the power is the power of a clear-seeing and clear-choosing denial of what is below and what is above mortal need.

To bring the characterization to focus, I cannot do better than quote two passages that seem somehow wonderfully to illustrate this complex mode. And the first is to be the beautiful phrase in the *Ion* of Euripides where Creusa even in her agonized outcry against divine injustice finds need to recognize the bright sun-glory of the world:

> ἦλθές μοι χρυσῷ χαίταν
> μαρμαίρων, εὖτ' εἰς κόλπους
> κρόκεα πέταλα φάρεσιν ἔδρεπον
> ἀνθίζειν χρυσανταυγῆ.

Thou camest to me, thy hair ablaze with gold, while I plucked into my bosom yellow flowers, to bloom on my robes like golden mirrors. . . .

And the second is to be the Aeschylean fragment from the *Niobe:*

> μόνος θεῶν γὰρ θάνατος οὐ δώρων ἐρᾷ,
> οὐδ' ἄν τι θύων οὐδ' ἐπισπένδων ἄνοις,
> οὐδ' ἔστι βωμὸς οὐδὲ παιωνίζεται·
> μόνου δὲ Πειθὼ δαιμόνων ἀποστατεῖ,—

which Murray has translated:

> Lo, one god craves no gift. Thou shalt not bend him
> By much drink-offering and burnt sacrifice.
> He hath no altar, hearkeneth to no song,
> And fair Persuasion standeth far from Death.

In the phrase from Euripides is poetic light, in this from Aeschylus is poetic power. Neither quality is without parallel—constant parallels—in other literatures. I have already given, as

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indeed Arnold had given, instances of the luminous mode from other than classical sources. And nigh the verses of Aeschylus I think we may not unworthily set this Red Indian song on the like theme:

There is no evading death;
The old men have not told that any has found a way to pass beyond it;
The career of a Leader is difficult of accomplishment.

Here, as there, is terse and simple directness; here, as there, is force through force repressed. But in the Grek instances there is something more than the naked qualities, a something gained through *composition*—psychical composition. It is the wonderful balance of emotion and sense, both true at the highest pitch, which we see in Creusa; it is the temper of enduring wisdom which we feel through the hurt in Aeschylus.

It is, of course, trite saying that we owe literary *form* to the classic mode. Yet I think it may be worth the saying this once again if we may understand by form this subtle balance—vivid mood and temperate control of all the senses with which nature has endowed us. Expression so moulded will be bright with the illumination of reason and of sense and strong with the power of inner mastership.

IV. THE SAXON AND CELTIC MODES

Zeus, Father of Gods and Men, in whose presidency over the games at Olympia as in his supremacy in the divine council at Olympus is made visible the spirit of Pan-Hellenism,—Zeus, the clear and glowing Heaven, is undisputed lord of the sunny South. His namesake of the North, Norse Tyr and Saxon Tiw, sinks to a wholly secondary place in the pantheon. Other gods of the upper elements rise above him, gods no longer derived from the tranquil-shining aether, but embodiments of storm and turmoil. Mid the dim and dank German forests, it is Woden of the wind and rain, haunted by croaking raven and snarling wolf, Woden, the bellowing leader of the Wild Hunt of souls athwart the nightly sky. In Scandinavia, where the shadows are deep and chill and Nature colors with cold purples and bloody crimsons in

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place of the azure and rose of the South, Thor, the Thunderer, hammers out the ways of men, wielding to their terror that thunderbolt which seems but as a kingly scepter in the hands of the Southron Zeus.

Mythologies show only too well how Nature rules men's moods; and we ought never to forget that the persistency of mood is the very essence and definition of personality. The Teutonic gods only reflect the Teutonic temper, which in turn is but the impress of the North upon the souls of men.

It is generally conceded that this Teutonic temper gives the backbone to English literature. The Celtic, with finer instinct for form and more sensitive imagination, gives the delicate hues of rosy flesh, but bone and muscle are Teuton. This is most natural. From the beginning the Anglo-Saxon mind has been heavy and tenebrous. In primitive times it was moved only by hard knocks: the massy alliteration, the aggressive impact, of its epic verse was necessary to arouse it from somnolence. Anglo-Saxon poetry moves by pounding: it echoes the thwack of cudgels, the clang of swords, the braying screech of spear against shield.

Ne wæs ecg bona,
ac him hilde-grâp heortan wylmas,
bân-hûs gebræc.

No blade was slayer; the bare battle-grip
Sundered the bone-house, freed the heart's billows.

This is the language of the *Beówulf*—a language of iron strength and nerve. Something of its spirit may be gleaned from metaphors such as *bân-hûs* (bone-house) and its parallel "bone-vat" applied to the human body; and again in "whale-road" and "wave-fortress" as names for the sea, we get something of the intensity and fearlessness of Anglo-Saxon imagination.

The language abounds in similar expressions—*kennings,* as they are called, conventions of poetic insight. Instead of a death-bed there was a "slaughter-bed"—it was a day when men died in their boots, dreading naught more than the stay-at-home "straw-death." The sea was the "terrifying sea," abode of drakes and nixes, but none the less a "path," a "road," a "way"

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for the compassless, restless rover from the North. Spaciousness was "sea-gaping"; thoughts were "mind-fettered"; the skull was a "bone-helm" and had need of being serviceable. It was the language of men of a temper not to be toyed with, a temper of Gothic gloom, contemptuously defiant of death. Browning, of our modern poets, perhaps best catches the masterfulness of the old imagery: Shelley "Sun-Treader"; "Spring's arrowy summons"; the "year's snow bound about for a breast-plate";—instances out of a multitude.

In all Anglo-Saxon poetry three themes seem most native and natural, three features most characteristic. There is the *sea* and *fate,* there is *battle* and *energy,* there is *religion* and the *grim seriousness* of life.

No illustration better typifies the first of these than the story of Scyld. A babe and alone, he sailed from an unknown port to be borne at the will of the waves to the people who were to make him theirs. Among them he grew up to kingship and ruled long in glory of prowess and wisdom. When at last he came to die the thanes he had gathered about him, in "mourning mood," laid his gold-adorned body, in the midst of kingly gear, beneath his kingly banner, nigh the mast of his viking ship, "ice-bright and out-eager," and freeing the ship from her mooring, yielded him up once again to the will of wind and wave. It was reverential propitiation wrought by the spell of the sea, by that awed sense of the sea's fatefulness and dooming which Pierre Loti brings home to us in his *Pêcheur d'Islande.* Of all natural majesties none seems greater than the ocean's Titanism; the human heart is abashed before it and it beats upon the imagination with pitiless insistence. The restless regularity of wave and tide, the mighty heavings up and strong subsidences of waters, infinitely various yet infinitely monotonous,—these overwhelm with a sense of on-riding destinies. So in the gray North, beside the boundless haunt of fog-veiled death, the waves hewed the human mind to its conception of Fate, *Wyrd,* giving it something of the hardness of granite brunting the sea, together with granite abidance of destined ends. From this hardening influence of the ocean comes the distinction of the sea-faring Teutons from

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the in-dwellers: the homely tenderness so winsome in the German, more and more giving place to the "mind-fettered" mood of a race made dumb with its striving.

For Gothic fatalism was never passive; it was always the Northern way to greet fated doom full-panoplied, warring to the last,—in the mood which Henley's *Invictus* has modernized for us. And so it is that the second great characteristic of our forefathers' poetry—battle and energy—springs from their passion for putting forth strong effort. They seem to have fought more for the berserk joy of it than for plunder-pleasure or glory,—at least their poetry reads so. I have already quoted one grim passage, the weaponless rending of a foe, here no monstrous Grendel, but a man. It is unnecessary to multiply examples, yet I might call to mind that vivid figure in the Finnsburg fragment: "the sword-flame *stood* such as all Finnsberg were afire." It may be pedantic to italicize "stood"; but it seems to me that this metaphor holds the very soul of the race's force: the simile gives the heat of the fight vividly enough, but it must needs be made superlative in metaphor—for it is only the intensest of flames that *stand.*

But there is yet a third characteristic, religion and the serious mood of men who see life, as Milton saw it, in its cosmic setting. Bede tells us how, when the men of Northumbria gathered to debate the adoption of the Christian faith in place of their ancestral paganism, an old earl gave rede in a speech which wonderfully preserves for us the higher mood. I quote Green's rendering: "So seems the life of man, O king, as a sparrow's flight through the hall when you are sitting at meat in winter-tide, with the warm fire lighted on the hearth, but the icy rain-storm without. The sparrow flies in at one door and tarries for a moment in the light and heat of the hearth-fire, and then flying forth from the other vanishes into the wintry darkness whence it came. So tarries for a moment the life of man in our sight, but what is before it, what after it, we know not. If this new teaching tells aught certainly of these, let us follow it." And it was only after the adoption of Christianity that the Anglo-Saxon imagination attained its full dominion. Then it was that Caedmon sang his

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lay of the First Shaping, finding for the first time cosmical metaphor comparable to the old Hebrew and in his *Genesis* already prophecying Milton; while Cynewulf, uttering the passionate yearning of the sea-saddened Teuton, struck the master-motiv of the long symphony of English poetry.

I have cited Browning for the Saxon, but he knows other modes as well:

> The gray sea and the long black land;
> And the yellow half moon large and low;
> And the startled little waves that leap
> In fiery ringlets from their sleep. . . .

Here is a spirit altogether new. "Natural magic," Arnold calls it, and he tells us that it is the characteristic mode of Celtic poetry. It belongs to an atmosphere of wizardries and night-breaths, of glimmering wonders and mysteries of dreams. The Celt sees Nature animate: the sea teems with sprites, playful or malicious, the forest is denizened with pixie and fay, every inch of ground is outlandishly agog with goblin and gnome. The reason is doubtless to be sought in the high-wrought Celtic sensitiveness to impressions, especially to those of a will-o'-the-wisp sort.

Arnold characterizes: "An organization quick to feel impressions, and feeling them very strongly; a lively personality therefore keenly sensitive to joy and sorrow; this is the main point. If the downs of life too much outnumber the ups, this temperament, just because it is so quickly and nearly conscious of all impressions, may no doubt be seen shy and wounded; it may be seen in wistful regret, it may be seen in passionate penetrating melancholy; but its essence is to aspire ardently after life, light, and emotion, to be expansive, adventurous, gay."

Taliessin in a *Song to the Great World* celebrates this aspiration after light, this joy in mere wealth of sensation:

> I will adore my Father,
> My God, my strengthener,
> Who infused through my head
> A soul to direct me;
> Who has made for me in perception
> My seven faculties:

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Of fire and earth,
And water and air,
And mist and flowers,
And southerly wind.[8]

There is no mistaking the natural pantheism. The poet is in earnest when he speaks of fire, earth, water and air, of mist, flowers and wind as faculties of perception. He does not distinguish his life from the life of the objective world of qualities (*not* elements, be it noted). Elsewhere Taliessin sings:

I was with my Lord in the highest sphere,
On the fall of Lucifer into the depths of hell:
I have borne a banner before Alexander;
I know the names of the stars from the north to the south;
I have been on the galaxy at the throne of the Distributor;
I was in Canaan when Absalom was slain;
I conveyed the divine spirit to the level of the vale of Hebron;
I was in the court of Don before the birth of Gwdion.
I was instructor to Eli and Enoc;
I have been winged by the genius of the splendid crosier;
I have been loquacious prior to being gifted with speech;
I was at the place of the crucifixion of the merciful son of God;
I have been three periods in the prison of Arianrod;
I have been the chief director of the work of the tower of Nimrod;
I am a wonder whose origin is not known.

An odd infusion, this, of half-won Christianity into the shape-shifting Druidic pantheism; we are led to surmise a monkish revision of an earlier and more purely pagan Taliessin. Indeed, such an one we find,—as pure Druid as is the heathen Amergin of the Irish,—who proclaims:

I am the wind that blows upon the sea, I am the ocean wave, I am the murmur of the surges;

[8] From Skene's *Four Ancient Books of Wales*. The citations of Celtic poetry in this essay are chiefly from Skene's work, from the *Mabinogion*, from the collections of Dr. Smith, and in one or two indicated instances from Macpherson's *Ossian*. It is no part of the argument to discuss the age or authenticity of any of these poems; it is enough that they are of unquestioned Celtic authorship and spirit. Whatever the inspiration of the Eighteenth Century Celtic Revival, its expression is as characteristic as the work of Yeats and Sharp in the Nineteenth Century.

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I am seven battalions, a strong bull, an eagle on a rock, a ray of the sun;
I am the most beautiful of herbs, a courageous wild boar, a salmon in the water, a lake upon the plain;
I am a cunning artist, a gigantic, sword-wielding champion,—
I can shift my shape like a god.

In other literatures we find parallels to this mood. Empedocles teaches that "with earth we perceive earth, with water the water, with air the air divine, and with fire devouring fire, while love is perceived by means of love, and hate by dismal hate." He tells us, too: "I have been youth and maid and bush and bird and a shining fish in the sea." But Empedocles is a prophet of novel and strange ideas, rather than the voice of a popular conviction. His pantheism is Eastern rather than Western, and is more akin to the Transcendental Ego figured in Emerson's reading of *The Sphinx* than to the phantasmagorial Naturism of the Celt.

A nearer parallel lies in the democratic ubiquity of Walt Whitman's expansive Self; for self-expansion, magnisonant in expression rather than pompous in mood, is the very breath of life to the Celtic soul. Nature and man are all one broidery, interminably interwoven. This is the secret of Celtic natural magic; it springs from the Celt's responsive susceptibility to all the changing glamors of sky and sea, to all the eerie wisdom of the wood, to all the impulsive joys and fears of the world of wilds. It gives him, too, an illocative errantry of mood which naturally seeks in lyric metaphor its fitting expression. Here is a Highland lover's lament for lover:

Like two plants smiling in the dew,
By the side of the rocks in the warmth of the sun,
With undivided root,—
Two plants happy and joyful.
The maids of Caothan forebore to hurt the plants;
The light hinds also spared them;
But the boar gave one of them its death.
Heavy, heavy, with bending head,
Is the one weakly plant that still lives on,
Like a bud withered under the sun.
O happy were it to be without life!

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Where else could have been attained the tender warmth of this allegory save in a mood passionately *en rapport* with Nature and graced with a child's implicit faith in Nature's never-failing responsiveness to the heart's need?

But Nature is not always kind. She may prove most fickle of mistresses, utterly cruel to those who love her. Against this inconstancy, when caress gives place to stormy lashing, the Celtic soul rises in mad revulsion. The trust has been perfect; the hurt is sore; the heart cries out. Read in *The Black Book of Caermarthen* the curse upon Seithenhin whose vice brought the destroying sea upon the plain of Gwydnen; or in *The Red Book of Hergest* the rebellious imprecation of the old bard against the crutch-token of his vanished youth and beauty; or again, that wail over the woes of war—desolations inviting race suicide,—

> It is not well that a son should be born:
> His youthful destiny
> Will perforce be unbelief
> And sore privation. . . .

Yet if the Celt was extravagant in sorrow, so was he exultant in stress of battle. He gloried in the red spectacle of war-wrought slaughter:

> Mild beams belong not to the storm;
> The soul of Gaul is in the roar of battle!

cries one of Ossian's heroes, voicing the spirit of an ever-contending though ever-vanquished race, a race too hot-headed to abstain from quarrel, too valorous to be cautious in the fight.

It is not difficult to draw antitheses between the two folk-souls, the Saxon and the Celtic. The essential difference cannot appear more clearly than in the contrast of the passing of Scyld and the passing of Arthur. There is a striking outward similarity, but the tempers of the two episodes are all at odds. On the one hand we have a bare outline of the event; there is a dumb tugging, a straining hush, with only the over-impending sense of doom to exalt the bald reality. On the other, there is all the atmosphere of magic illusion: the uncanny waste, the wailing mere, the mysterious funeral barque thronged with shadowy

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mourners from a magic land,—throughout, the echo of prophecy, Celtic fey-vision.

The antithesis appears again in direct comparison of the formal elements of the two poetries. Saxon poetry is laconic, forceful, pointed, never illogical; Celtic is full of irrelevant by-play and inconsequential succession of ideas,—the eye has seen too much to have perceived any one thing seriously. Both literatures abound in parenthesis and apposition; but in the Saxon these are always significant to the matter in hand, in the Celtic they are mere incidental suggestion. The distinction reappears in dramatic handling. Celtic recitative as Saxon epic was chanted to the harp's accompaniment. But the bard seldom troubles himself to designate a speaker in his tale; himself assumes rôle after rôle, doubtless with dramatic impersonation, leaving his audience to infer from the context the turns from character to character. On the other hand, the gleeman, having to do with less quick-witted hearers, takes no chances; each hero is formally introduced: "Beówulf spake, son of Ecgtheów,"—such is the formula. Possibly here we have a Saxon emphasis of individual right and dignity in contrast with the expansive impersonality of the Celt.

Other qualities are no less in contrast. Compare Saxon and Celtic metaphor. I have already given examples of the former: *hilde-gicel,* "battle-icicle," the fast-chilling pendant of blood clinging to the sword after carnage,—that will recall their quality. How unlike is Ossian's likening of a woman's soul to "an impetuous current foaming white within a rocky strait": or Taliessin's "minstrelsy of perception" and "baptism of consolation" in that *Song to the Great World* already in part quoted! The very title of that song, or of that other *To the Wind,*—do they not distinguish the Celt from the Saxon?

Indeed, we cannot do better than set beside the magniloquent devotion of Taliessin's hymn,

> I will adore my Father,
> My God, my strengthener. . . .

the humility and simplicity of Caedmon's

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Lo, we shall laud Heaven-realm's Lord,
The Maker's might and His mind's thought,
The works of the Father! Wonder with wonder,
He, the Eternal, established a world!
First for earth's children reared as a roof
The high dome of Heaven—Holy Creator!
Made, then, the mid-earth—Warder of Men,
Lord Everlasting! Thereafter the land,
A fold for us, fitted—Father Almighty!

In the one hymn the soul of the man leaps out into Nature, identifies itself with creation and the creative spirit; in the other, the whole bent is to circumscribe and restrict man's sphere, recognizing that his ways are limited and charted by the Power above. To the heathen soul of Beówulf this power was *Wyrd,* fate, to the gentler-minded Caedmon the God of the new religion; yet to them both it was external to man, man-ruling. It is only the Celts, a recent investigator tells us, who believed and taught in myth that men had warred with and conquered gods,—perhaps the crude and primitive expression of their indomitable conviction that the divinity in man and Nature, at the last, are one, that the human vision of beauty in the world is vision of Nature's final truth.

Nature awed the Saxon chiefly by her manifestation of strength,—the *terrifying sea!* He felt the inevitability of the dooms of the Norns, and thence arose his Hamlet-like sense of human tragedy and of the final paltriness of the mere human soul. Hamlet, indeed, is the typical Shakespearian embodiment of the Teutonic spirit, just as Macbeth and Lear are Shakespeare's typical Celts. A similar contrast holds between Goethe's Faust and Marlowe's Faustus. On the one side is tragedy of the idea pitilessly wrought out under inexorable fates; on the other is tumultuous rebellion against the fortune that proved unconquerable. *Fate* and *Fortune!* the Teuton beholding in Nature a mistress whose will he cannot overcome but whose doomings he can endure with uncrushed lordliness of soul; the Celt perceiving in her a Fortuna to be won by ardent wooings, to be lost with cataclysmical despair.

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In our modern literature we get from the Celt our love of wild nature, not perchance of meadow-green and the springtide glee of birds, but of nature in wider sweep, tameless impulse. The Celtic imagination never hesitates, its sympathy is limitlessly expansive. I know of no finer-poised image than in Ossian's (Macpherson's Ossian) address to the sun, "thou tremblest at the gates of the West",—seizing and vivifying that instant of luminous hesitancy when the sun quivers upon the verge of the western wave, as if timorously reluctant, ere it plunges beneath the dark waters. And what loftier in prophetic sadness than in that same poem,—

> Thou art perchance, like me, born for a season;
> Thy years will have an end;
> Thou shalt sleep in thy clouds, careless of the voice of the morning.

Again, the passion for beauty is surely Celtic—for beauty unspoiled by morals and moralizing. Keats is unmistakably foretold in the Cymric bard's

> The beautiful I sang of, I will sing!

And as unmistakably Keats echoes again the airiness and fairiness, the magic and music and mystery of bardic poetry. In

> . . . . magic casements, opening on the foam
> Of perilous seas, in fairy lands forlorn. . . .

Arnold finds the authentic note of Celticism. But it is not in Keats alone. Perhaps no verses of his great romantic contemporaries are oftener quoted than Coleridge's

> . . . . woman wailing for her demon lover . . .

and Wordsworth's

> . . . . old unhappy far-off things,
> And battles long ago.

And in these, too, the Celticism is surely unmistakable and authentic.

Beauty and sympathy: the detail, the tenderness and vividness, the richness and radiance of our nature poetry, come from the

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Celt. But the idea is Saxon; and Saxon is that strength, at its greatest Titanic, which gains its compulsoriness from ideational empery; and Saxon is the dignity which belongs to those who have found themselves, and finding have conquered; Saxon, too, are the will, the equipoise, the motive, the power,—all the Shakespearian majesties.

V. FUSION IN THE BALLAD

For knowledge is a qualification much in vogue in philosophical discussions, and it expresses a distinction really invaluable for any critical analysis. The phrase discriminates what we may call the manners of realities from the realities themselves; it indicates that natural selection of the significant and utile which is an instinct of our attention, and it emphasizes the notion that our perceptions of disjunct phenomena are exaggerations of what differences really exist.

If we are to live and grow it is essential that we perceive some things very clearly; accessory detail may be elided and must be elided in order that we may profitably attend to the main point. Hence all our truth is partial and biased, and the striking distinctions we draw for the sake of emphasis are almost invariably what the philosophers term distinctions for knowledge alone. The reality about which our truth is true is far more complex than we make it appear for it is composed of an intermingling of elements too intricate for knowledge to grasp. Truth itself is merely the picturesque aspect of things,—always, therefore, a somewhat superficial aspect.

The contrast which I have drawn between Saxon and Celt is truth of this picturesque sort. The contrast is exaggerated because of the isolating of the traits compared. When these traits are set into the general context of human nature, as they are set in the real men, they appear far less antithetical and antagonistic: the differences become obliterated in the envelope of a mutual clay. Shared by all mankind and coloring communally men's reasonings and humors are certain fundamental loves—attractive, jealous, or perverse,—hates and their attendant fears, hopes with eager aspirations quick at their heels. These form

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the major composition of human character and the basis of intercourse and understanding. But just because the major character—human nature—is universal, it cannot furnish a text for discriminations; the marking of differences must be on a scale of minor moods.

Similar qualification applies to literatures and critical separations of them. Just as Arnold's 'luminous mode' is the elemental mode of all poetry and a *sine qua non* of any poetic development, so the elemental impulses of the poet are those which first find expresssion in his work. They are the primordial impulses of human nature; their appeal is universal and they always appear in the theme and treatment of what the critics call world-literature. Shakespeare is neither Saxon nor Celt nor mere Englishman: he is a laureate of mankind.

But *exceptis excipiendis,* as the scholastics have it,—let us except the things that are to be excepted and take for granted what ought to be assumed. The prefaces are palpable. What point remains?

Well, there remains the picturesque truth. Despite the conformity of their cephalic indices, the substantively staid Englishman is not apt to be mistaken for the roisterous son of Erin. And in primitive literatures it is difficult anywhere to find a sharper or more consistently maintained contrast of neighbors than exists between the first poetries of Saxon and Celt. There is never any danger of confusing their characteristics: energy and fire, steadfastness under fate,—these are Saxon; and as invariably buoyancy in joy, tumult in despair, belong to Cymry and Gael.

But all this is for literature in embryo,—before the English had come to its own. There was to be an era of fusion; thereafter, a people. And amid this people any poet might challenge his lineage in vain to show sole paternity for one race or the other; never could he thread warp of Saxon from woof of Celt, nor in his fabricked character say what shimmer came from this thread, what from that. Time is in truth alchemical: no material is invulnerable to its transmutations; granted sped years, new creation is certain. So time created the poet-soul

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of Albion. Hereafter we cannot speak of a Celtic poetry and a Saxon poetry, but only of an English poetry. Yet in this English poetry we may continue to discriminate a Celtic from a Saxon *mode,* for in our study of origins we have come clearly to understand what each of these modes denotes. Just as all poetic insight instinctively finds first expression in the luminous mode, so the peculiar insights arising from the commingled ethnic strains seek expression in the modes anciently native to each. But because the blood, long-fused, has become one, any discrimination of mode must henceforth be understood as made only for criticism and significant only *for knowledge;* there is not meant to be any scalpular analysis of the organization either of poet or poetry.

The truest expression of the folk-soul of any race, especially since the development of culture-tradition and the accustomed contacts of civilizations, is to be found in its people's poetry—in the songs and ballads of the tavern and the farm-stead. So with the English. Throughout the Dark Ages fusion was slowly wrought, begun, as was natural, and first completed in the lower strata of society. Literature during the period betook itself perforce to the shelter of the monastery; later, with the advent of the Norman, to the patronage of the Court. But monkish *belles-lettres,* after the Saxon era, comprised little beyond Latin hymns, not over-delicate, or, in English, such dreary monodies as the *Ormulum* of Orm; and the poetry of the Court under the early Plantagenets was exotic importation from the land of the trouvère. Not until the Thirteenth Century pre-Renaissance renascence was there produced a real English poetry. The early revival culminates in Chaucer. Thereafter a lapse during the Wars of the Roses, and then the sudden glories of the great era. But the literature composed under Elizabeth was more than a folk-literature. Classic culture, Italian and Greek, entered in to complicate its character. The blood of the race shows not less red and vigorous; we perceive the native element not less surely; but for wholly untaught manifestation, we must look elsewhere.

During all these periods, nighest the heart of the people, was

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a literature of minstrel balladry. It antedated and persisted through the major development. In it we see crystal-clear the various facets of English character,—the turn that leads to Puritanism, the metaphorical idealism, grim repression alternating with fancy free. As with the old epic and recitative, harp accompaniment was long essential; but at the same time the words were beaten into finer rhythms and rimes and metres—a music of their own. Again, the moral of the tale, the ethos of the literature, maintained itself; but together with much poignancy of mood. In the English ballad, in short, we have a form half way between ethnic chant and the lyric flower of civilization.

I am aware that there is some present-day cavil against the autochthonous character and origin of our balladry, companioned with depreciation of its literary quality. *Réchauffé* is the term applied, the ballad being viewed as consequence and expression of an enervated Medievalism, the ballad-maker being reckoned akin to the modern decadent.[4] I conceive that the broad comparative studies and keenly critical analysis of such men as Francis Gummere have finally 'laid' this spectre. "The minstrel of more romantic associations had nothing to do with the making of those typical ballads of tradition which form the bulk and give the quality in any collection of note," he tells us. While it is not for me to judge the contention, the interpretation of balladry lying in my interest applies whether it be conceived as the product of a dying guild of Medieval poets or—what the evidence favors—the untaught expression of the common folk preserved in "household and communal memory."

What is crucial is to know that the ballad was really popular and did lay vigorous hold upon the imagination of the race. This we are sure of at least from the day when Langland's parson mastered "rymes of Robin Hood" in place of ritual; and for the rest, I conceive that one reference, 'transcribed from the singing of a milkmaid' or 'taken from the lips of a very old countryman,' is worth some volumes of critical exposition,—certainly it precludes a doctrine of cult in ballad appreciation. Fur-

[4] G. Gregory Smith, *The Transition Period*, Ch. VI.

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ther the conspicuous character of the ballad is as *chanson de geste,* and we know that the singing of exploits is as old as valorous conceit. In Caedmon's day we get a glimpse of convivial tale-telling; and if we are to credit the claimed antiquity of the Welsh poems, we have obvious British ballads in the Sixth Century.

The universality of the song habit in the two main races of old Britain should explain the ingrained persistence of it; yet to clear some lurking doubt, I would cite late survivals of the old lore. In America, at least, they are not wanting. I have seen, amid yellowed papers of the late Eighteenth Century preserved in a population whose literary asset was fairly circumscribed by the Bible, the Farmer's Almanack and the New England Primer, a carefully transcribed ballad in theme and form typical of the old school,—a tale of parent-combatted love, of seafaring, of murder, of ghost and retribution. And I have seen ballad-making still in progress in Nebraskan countryside, as doubtless it persists, despite the ubiquity of print, in remoter frontiers. For a showing of quality I borrow from a friend's recollection (surely an approved source!) a fragment of Western song, the context unfortunately lost, which for tersely grim humor might belong to the hey-dey of balladry.

A red man lived down in Tennessee,—
Mighty big Injun sure,—
He growed as tall as the tallest tree,
And he says, says he,
"Big Injun me,
Mighty big Injun sure."

White men blazed out a road, you see;—
Mighty big Injun sure,—
He combed their hair with a knife; says he,
"It's combed for good—
Big Injun me,
Mighty big Injun sure!"

And this eloquent bit of metaphor introduces the question of poetic values, where the veriest layman has right to opinion.

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One may safely appeal to the *consensus gentium,*—not of boors and milkmaids, but of poets. Sidney's clarion phrase rings impulsively to mind: "I never heard the old song of Percy and Douglas that I found not my heart moved more than with a trumpet." That alone were sufficient were we not over-rich in corroboration. Perhaps one may best name the poets of our later era who have found model and inspiration in the popular balladry: Scott, Burns, Keats, the Rosettis, Swinburne, Kipling . . . but the whole gamut must be run to name them all; for no influence has better seasoned modern English poetry than this of the native song of the people.

No words are better on this theme than the sane appraisal given by Professor Gummere at the close of *The Popular Ballad*: The majority of our ballads, he says, "must be classed as inferior poems. The best, even, cannot compete with great poems of art; but there is a greatness of their own in their attitude towards life, in their summary and transcript of it. They know, as the lords of tragedy in Hellas knew, as Shakespeare knew, that only the anguish of some inevitable conflict is worth while. They know by instinct, as lyric poets have known in their 'recollected emotion,' that while tragedy is insoluble, it holds the solution of existence in its own mystery, and that only from death springs the meaning of life."

"*They know by instinct,*" and with instinctive surety press home, that poignancy of life which is the soul of poetry.

But my present interest is to show in the ballad literature the first clear fusion of the Saxon and Celtic modes; and this asks the reader's assent only to the genuineness of the ballad inspiration, as voicing the character and ideals of the normal Englishman of the mid-period. Which conceded, it is due time for illustration. I will not quote *in extenso* nor cite more than typical instances; the reader may call to mind further substantiation.

Let us begin with the untouched Saxon mode,—and there are many ballads similar in construction and theme to this Scottish ballad of *Edward,* which Brahms has so magnificently interpreted in the sister art:

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Why does your brand sae drap wi' blood,
Edward, Edward,—
Why does your brand sae drap wi' blood
And why sae sad gang ye oh?
"Oh I hae killed my hawk sae good,
Mither, mither,—
"Oh I hae killed my hawk sae good
And I had no mair but he oh."

The mother replies:

Your hawk's blood was never sae red,
Edward, Edward,—
Your hawk's blood was never sae red,
My dear son I tell thee oh.

And the son, answering:

"Oh I hae killed my red-roan steed . . ."

To which the mother again objects:

Your steed was auld and ye hae got mair,
Some other dule ye dree oh.

And then:

"Oh I hae killed my father dear,
Mither, mither,—
"Oh I hae killed my father dear,
Alas! and wae is me oh!"

And whatten penance will ye dree for that? . . .
"I'll set my feet in yonder boat,
And I'll fare o'er the sea oh."

And what will ye do wi' your towers and your ha'? . . .
"I'll let them stand till they down fa' . . ."

And what will ye leave to your bairns and your wife? . . .
"The world's room, let them beg through life . . ."

And finally the last significant stanza, with its revelation of the meaning of the whole:

And what will ye leave to your ain mither dear,
Edward, Edward?
And what will ye leave to your ain mither dear,
My dear son, now tell me oh.

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"The curse of hell frae me shall ye bear,
Mither, mither:
"The curse of hell frae me shall ye bear,
Sic counsels ye gave to me oh."

The point is driven home relentlessly. There is no mincing matters; all is simple, direct, merciless; the steel of the language is naked and cruel. This is the Saxon way,—the way of the old Icelandic sagas, too, and of the Russian prose writers in our own day.

Let us turn now to the Celtic mode. In ballad literature it appears largely in tales of enchantment and magic. *Kemp Owyne* and *The Twa Magicians* are instances; but the one comes from Cymric Wales and the other from Gaelic north Scotland. In their ready animation of the inanimate, their lively personifications, their magical transformations, we recognize the ethnic spirit which created them. But in strictly English balladry there are equally good examples. If, as Stopford Brooke conjectures, *The Three Ravens* represent the Teutonic eagles of the battle-field, we have in the little lyric-ballad of that name treatment of a Saxon theme; but the beauty and delicacy of the poem irresistibly recall the tender allegory and quick *rapport* with nature of that Highland *Lover's Lament* earlier quoted, and the lightness of touch, the atmosphere of magic myth, are unmistakably the Celtic mode.

There were three ravens sat on a tree,
Downe, a downe, hay downe, hay downe,
There were three ravens sat on a tree,
With a downe,
There were three ravens sat on a tree,
They were as black as they might be,
With a downe, derrie, derrie, derrie, downe, downe.

The one of them said to his mate,
"Where shall we our breakfast take?"—

"Down in yonder green field,
There lies a knight slain under his shield.

"His hounds they lie down at his feet,
So well they can their master keep.

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"His hawks they flie so eagerly,
There's no fowl dare him come nigh."

Down there comes a fallow doe,
As great with young as she might go.

She lift up his bloody head,
And kist his wounds that were so red.

She got him up upon her back,
And carried him to earthen lake.

She buried him before the prime,
She was dead herself ere even-song time.

I have quoted these two ballads as representing extremes, but even so we see evidences of that fusion clearly marked in the mass of the ballad literature. In the dramatic form of presentation, in the repetition and refrain, we see the Celtic spirit; and even the dominant Saxon note, of terse irony or brawny green-sward vigor, is continuously surprised into delicacies of diction and a buoyant tenderness for nature surely Celtic; it is as if the poet's robuster purpose were startled into beauty by roguishly winsome sprites of fancy only half acclimated to his mood and still eyed a little askance. The character appears, in its perfect fusion, as well as in any ballad I recall, in the almost pert tragedy of the song called from its refrain, *Fine Flowers in the Valley:*

She sat down below a thorn,
Fine flowers in the Valley;
And there she has her sweet babe born,
And the green leaves they grow rarely.

"Smile na sae sweet, my bonnie babe,
And ye smile sae sweet, ye'll smile me dead."

She 's ta'en out her little penknife,
And twinn'd the babe o' its sweet life.

She 's howket a grave by the light o' the moon,
And there she 's buried her sweet babe in.

As she was going to the church
She saw a sweet babe in the porch.

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"O sweet babe, and thou wert mine,
I wad clead thee in the silk so fine."

"O mother dear, when I was thine,
Ye did na prove to me sae kind."

And in this ballad the irrelevant refrain throwing an echo of nature into the human tragedy and the sweetness of "ye'll smile me dead" are Celtic; the *dénouement* and the keen irony are Saxon. The best qualities of each of the primitive poetries are present: delicacy together with significant repression, nature-sympathy with moral sternness, a diction of expressive melody, yet austerely direct;—and all a foretelling of the perfected lyric.

VI. THE TURN INTO METAPHOR

All forms of poetry interact upon one another and by subtle gradation pass into one another, so that the development of each is accompanied by coordinate modification of the others, some one form, best adapted to the poetic insight of an era, dominating and molding what others persist along with it.

Customarily we conceive the Elizabethan period as the period of paramount drama; but it may fairly be questioned if the real sovereignty belonged not to lyric passion. Certainly the drama of that age is glorified with song as is no other modern drama, while the more intimate poets' poetry—bloom of garden solitudes—shows less tendency to bow to dramatic mastery than even Victorian lyricism. Likely the music-fire of old England—not yet snuffed out by Puritanism—had much to do with preserving unalloyed the joyous melody of Elizabethan song; but I think, if the conceit be not too fanciful, that in that lyric sweetness we hearken rather the swan-song of a dying music-poetry. The full flush of the great era brought English genius to the parting of the ways: thereafter must be chosen wholly musical or wholly poetical embodiment,—the word must divorce the singing for the sake of more sublimate harmonies, the note must wing free from the word for the fluting of airier melodies. The poetic fruition was chosen, and the seal of the choice is found in accentuation of

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the metaphoric element of lyric mood, sensuous quality yielding to the need of finer psychical discrimination, personality becoming the poetic touchstone.

Song, I suppose, is the most primitive aesthetic expression of mankind, arising as emotional comprehension of emphatic impressions and issuing into life as a melody of singing words. The ballad, as a poem of action—"narrative is its vital fact" and "its supreme art is to tell its story well," Professor Gummere states—had at least one source in battle-boastings and laudations of prowess. At first the hero praised himself, narrating his deeds in the formal and lofty style implied by the old verb *mathelian,*—a flavor of the bombastic egotism of Mesopotamian monarchs inscribing their kingly conquests. Later appeared the professional minstrel in the chieftain's retinue, and with him the artistically finished narrative that ensured perpetuity of fame. Doubtless the ballad-form and its music setting—as distinguished from epic narrative—may have been created by antiphonies of dancers; but it is safe to conjecture the coordinate probability that war-challenge and death-chant constitute the primeval *chanson de geste* in the same wise that *mathelian* foretells poetic diction.

The main point is the loose annexation of music to ballad narrative,—the logical consequence of the narrative function. In musical art there are two fundamental modes of setting a song: the ballad form, in which the musical motiv is repeated stanza by stanza to the song's limit; and the lyric aria, in which the initial element *a* is repeated after an intervening element *b*, so that the whole form may be expressed *a:b:a.* In the ballad form the effect is derived from the verbal content of the song, which in ballad narrative moves to a dramatic climax; or musically from the contrast of word change with repeated melody, or yet from the mere emphasis which lies in repetition. In the lyric aria the composition is a unit, and the total effect depends upon a feeling for the whole form and a gathering up and inclusion of the entire movement in the final appreciation,—the repeated element seeming to absorb all that has gone before, and returning

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to the hearer with a subtler force and finality. On this distinction the ballad is relatively independent of the music, the non-dramatic song relatively subordinate to it.

Historically both have attained complete independence. The ballad by the use of refrain attains that effect of unity—emphasis in iteration—which is else supplied by the music; while the finer types of pure lyricism reduplicate, verbally or ideationally, the characteristic scheme of the lyric aria: there is a return in the last phrase to the chord struck in the first, with the added force of the intervening motive gathered into it, what was at first merely objective being made subjective and personal. This latter type of movement, in which external nature is poetically conquered and humanized, Ferris Greenslet designates "the lyric return," characterizing it as "the essential lyrical unity in which the poet objectifies his mood in the beautiful object, or by a kind of mystic egoism lays hold of nature to make her express himself."

Such unity, with its poetic mastering of Nature, is impressively achieved in Leopardi's *l'Infinito* (I quote Sir Theodore Martin's translation):

> This lonely knoll was ever dear to me,
> This hedgrow, too, that hides from view so large
> A portion of the fair horizon's verge.
> But, as I sit and gaze, thoughts rise in me
> Of spaces limitless that lie beyond,
> Of superhuman silences, and depths
> Of quietude profound; so by degrees
> Awe troubles not my heart. And as I hear
> The wind that rustles through the brake hard by,
> That fitful sound with these vast silences
> I set me to compare, and so recall
> Eternity, and the roll of ages dead,
> And the live present, with its mad turmoil.
> Thus thought is founder'd in immensity,
> And shipwreck in that ocean's sweet to me.

The shuttering confines of the narrow retreat serve only to arouse the poet's imagination, till, ignoring the limitations of sense, he passes ultimate horizons and takes compass of the still

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infinities; and at last, soothed through very awe, he measures the conqueror of time, the world's unrest and its quieting. Not less inclusive than the cosmos would be his soul; not more futile is the wrecked ship at sea than human life; the one attainment is the peace of surrender. A more native example is Shelley's *Ode to the West Wind,*—element after element of the wind's wild imagery is gathered to a cumulative node of energy till by the final strophe this energy becomes all the poet's own:

> Make me thy lyre, even as the forest is:
> What if my leaves are falling like its own!
> The tumult of thy mighty harmonies
> Will take from both a deep autumnal tone,
> Sweet tho' in sadness. Be thou, spirit fierce,
> My spirit! Be thou me, impetuous one!

The movement, be it noted, is ideational and emotional, not necessarily sensuous as in the lyric aria; but the principle and effect is the same—to give ideal unity and finish to the expression. Perhaps the fullest recognition of the psychosis here exemplified is in sonnet structure, the octet portraying nature, the sestet flooding with the spiritual illumination which is the poem's inspiration; but it is present also wherever the lyric, in contrast to mere song glee, becomes reflective or impressionistic.[5] In such poetry want of it is an imperfection likely to be keenly felt. For instance, Shelley's *Isle:*

> There was a little lawny islet
> By anemone and violet,
> Like mosaic paven:
> And its roof was flowers and leaves
> Which the summer's breath enweaves
> Where nor sun nor showers nor breeze
> Pierce the pines and tallest trees,
> Each a gem engraven.

[5] A perfect illustration of the ideational form, stripped of verbal refrain, is Walt Whitman's:

> As I watch'd the ploughman ploughing,
> Or the sower sowing in the fields—or the harvester harvesting,
> I saw there too, O life and death, your analogies:
> (Life, life is the tillage, and Death is the harvest according.)

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Girt by many an azure wave
With which clouds and mountains pave
A lake's blue chasm.

Spite of melody of phrase having a certain completeness, spite of vivid beauty, one cannot overcome a feeling of the poem's fragmentariness; the melody seems merely stanzaic, and appreciation is bewildered; there is instinctively demanded a striking in of poetic sunlight. The best lyrics always leave a mood of yearning and beauty-desire; but here we have only a need of fuller expression, and hence an artistic insufficiency.

In pure song the musical need is omnipresent, so that the simple outburst of mood is last of poems to break free from the musician's art; but at its best song develops an intrinsic music which satisfies this need,—as imperatively as, for example, does Swinburne's

If love were what the rose is,
And I were like the leaf . . .

The music may be verbal imitation of the lyric aria, with a terminating recurrence of the initial phrase or of its verbal quality,—and by far the most perfect example is Tennyson's threnodic "Break, break, break," throbbing the ocean's perpetuity,—or there may be instead a free outward flow and abandonment to limpid utterance. The first is literally reflective, adapted therefore to self-conscious expression as in the instances above. Free song, on the other hand, is never self-conscious, and its movement is always natural and unpremeditated, limited only by the singer's breath. It comes as the "careless rapture" of the Elizabethan mood,—all a joyous bubbling over of the singing soul. Usually such song is handily set to music, but it may be tune to itself. When so, it leaves always a suggestion of echo which gives it artistic finality. Take one of Ariel's songs, any one of them:

Full fathom five thy father lies:
Of his bones are coral made;
Those are pearls that were his eyes:
Nothing of him that doth fade,

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> But doth suffer a sea-change
> Into something rich and strange.
> Sea-nymphs hourly ring his knell:
> Hark! I hear them,—
> Ding, dong, bell.

How it echoes and dies away and echoes again, with distant fainting fairy note—away into the dim sea's depths, like a last quiver of violins after the wood-wind notes are gone! This is song suspense,—melodies suspiriantly repeating, like distant-sounding surfs, a world of song and wraith where soft pipes play

> Not to the sensual ear, but, more endear'd,
> Pipe to the spirit ditties of no tone.

Both in the lyric aria and in this simpler song, the development is cumulative: in each case the structure is close-knit, the order of elements is imperative, and the unity attained complete. The final effect does not depend upon mere memory, but upon the subtler psychical power of apperception—of apprehension of unities and complex wholes. Nor is this an apperception of the logical inter-linkings of ideas; it is apperception of mood and is founded in aesthetic as well as in ideational necessity; while on account of the elusiveness of mood comes the compulsory brevity of the expression which must make it one.

Now in contrast to this cumulative development stands dramatic development. In place of the onward poise of lyric movement, dramatic movement leads to a kind of shock—a turn and reversal of the wrought mood at the climax. In contrast to apperceptional retention of the whole, foregoing elements are driven out in the moment of surprise; there is an overturning of equilibrium and a long oscillation and a final effect only to be fixed by gradual quietings. The development may be of events, as in ballad narrative; it may be of ideas, as in epigram and witty song; it may even be play upon sentiment, as in Swinburne's exotic balladry;—but in each case it scores its effect by some sort of violence, wound and recoil. The method is masterful for driving home a point; hence for wit, satire, and irony. The ballad-makers knew the trick of it well. Take the fateful last

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lines of *William and Marjorie;* it would be hard to find more effective irony unless one choose *Edward,* or some other of the old songs; though we might pair it from Kipling's *Ballad of Fisher's Boarding House,—*

> But Anne of Austria looted first
> The maid Ultruda's charm—
> The little silver crucifix
> That keeps a man from harm.

For such dramatic development, the music-setting serves but as an enhancing background, its monotony of motiv giving the sense of unity and holding together the fleeting elements of the action. If the action be close-knit and inevitable, the accessory undertone is quite dispensable or may be allowed a development of its own subordinately echoing the major movement, on the analogue of a tragedy within a tragedy,—say Euphrania's to Penthea's in Ford's *Broken Heart.* This actually occurs in the artistic balladry of Rossetti, made possible by the substitution of word for musical refrain. And as a matter of fact we find in ballad development a curious disjunction of the music-form from the dramatic form. The one is abstracted under the domination of the singing impulse and made into a kind of song, later to become ballad of metaphor; the other, seized by a purely dramatic genius, is wrought into a new drama of metaphor. With the development from the music-form I am first concerned, and the better to illustrate it in English I would cite its forecasting in a Welsh form of verse.

A favorite stanza of the Welsh bard was the triad, or rimed triplet. Sometimes it was used for narrative, battle-description and the like, sometimes for a kind of gnomic verse. A slightly varying repetition of the first line, stanza by stanza, gave the effect of refrain, and often held together very divergent reflections. A few stanzas may illustrate: I quote from Skene's *Hergest:*

> The Calends of winter, the time of pleasant gossiping,
> The gale and the storm keep equal pace;
> It is the work of the wise to keep a secret.

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The Calends of winter, the stags are lean,
Yellow the tops of the birch, deserted the summer dwelling;
Woe to him who for a trifle deserves disgrace.

The Calends of winter, it is hard and dry;
Very black is the raven, quick the arrow from the bow;
At the stumbling of the old the smile of youth is apt to break out.

The Calends of winter, bare is where the heath is burnt,
The plough is in the furrow; the ox at work;
Amongst a hundred there is hardly a friend.

These are but a few stanzas from the many in the poem, none of which are closely interknit; their order seems to be wholly fortuitous. The main characteristics are a sameness of mood from the iterated dreariness of winter; a vividness of vision that notes the enhanced blackness of the raven against the snow; but a very gossamer thread of association joining the suggested ideas. Only a fleet-footed imagination can keep the pace; the whole movement is disconnected and episodic; musical accompaniment must have served in no small degree to create a main effect, and it will be noted that whatever unity the poem seems to possess is a unity of form in simple repetition, like the abstract music-form.

Let us set in contrast that curse upon Seithenhin heretofore alluded to.

Seithenhin, stand thou forth,
And behold the billowy rows;
The sea has covered the plain of Gwydnen.

Accursed be the damsel,
Who, after the wailing,
Let loose the Fountain of Venus, the raging deep.

Accursed be the maiden,
Who, after the conflict, let loose
The Fountain of Venus, the desolating sea.

A great cry from the roaring sea arises above the summit of the rampart,
Today even to God does the supplication come!
Common after excess there ensues restraint.

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A cry from the roaring sea overpowers me this night,
And it is not easy to relieve me;
Common after excess succeeds adversity.

A cry from the roaring sea comes upon the winds;
The mighty and beneficent God has caused it!
Common after excess is want.

A cry from the roaring sea
Impels me from my resting-place this night;
Common after excess is far-extending destruction.

The grave of Seithenhin the weak-minded
Between Caer Cenedir and the shore
Of the great sea and Cinran.

Seithenhin, it will be remembered, was a drunkard through whose negligence a gap was rent in the sea-dyke and a city's population swallowed up. In this poem the bard imaginatively hears the cry of the drowning people ringing up with the roar of the sea, which he magically personifies in the Celtic way, throwing it under control of witchery. But the structure interests most. There are three nearly coordinate developments:—of the event described, of the poet's emotion, of his moralizing reflection. The three are interwoven and carried forward by a double repetend, first verse echoing first and third echoing third, while because of well-knit theme, in place of monotonous reduplication the echoing verses admit progressive development. And the poem, trending toward dramatic development of mood, is made wholly self-sufficient, quite independent of music.

I have cited these Welsh poems as types, with inference as to the origin of similar forms in English poetry. They appear to show a disintegration of the ballad, the music-form of it made dominant in the first instance, and then, in the second, subordinated to a new, subjective dramatic evolution. In Caroline poetry we find parallel instances, showing, it seems to me, the ruling instinct for singing, native to the period. Certainly the following, from Robert Jones' *Fift Booke of Ayres—Onely for the Lute, the Basvyoll and voice,*[6] has neither dramatic nor song movement:

[6] B. H. Blackwell, Oxford, 1901.

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Love is a prettie frencie,
A melancholy fire,
  Begot by lookes,
  Maintained with hopes,
And heythen'd by desire.

Love is a pretie tyrant
By our affections armed,
  Take them away,
  None lives this day,
The coward boy hath harmed.

Love is a pretie idole,
Opinion did devise him,
  His votaries
  Is sloth and lies,
The robes that do disguise him.

Love is a pretie painter,
And counterfeiteth passion,
  His shadow'd lies,
  Makes fansies rise,
To set beliefe in fashion.

Love is a pretie pedler,
Whose packe is fraught with sorrowes,
  With doubts, with feares,
  With sighs, with teares,
Some joyes—but those he borrowes.

Love is a pretie nothing,
Yet what a quoile it keepes,
  With thousand eyes
  Of jealousies,
Yet no one ever sleepes.

The singing note is unmistakable enough, but there is no onward echo after the singing is done, as in the true song. It is all a dainty flitting from conceit to conceit, as of a bee fastidious among flower-bells. This is a customary character of not a little of the poetry of the period. An advance toward organic unity, however, is met in Crashaw's *Weeper,* which, though a series of idle toyings with the Magdalen's tears, as if they were in truth the pearls the poet would have them, yet in

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certain stanzas reveals a tighter reined fancy and a hint of dramatic interlinking. These come in the first flush of inspiration:

Hail sister springs,
Parents of silver-footed rills!
Ever-bubbling things!
Throwing crystal! Snowy hills!
Still spending, never spent; I mean
Thy fair eyes, sweet Magdalene.

Heavens thy fair eyes be;
Heavens of ever-falling stars;
'Tis seed-time still with thee,
And stars thou sow'st, whose harvest dares
Promise the earth to countershine
Whatever makes Heaven's forehead fine.

But we're deceived all;
Stars indeed they are too true,
For they but seem to fall
As Heaven's other spangles do;
It is not for our earth and us,
To shine in things so precious.

Upwards thou dost weep;
Heaven's bosom drinks the gentle stream.
Where the milky rivers creep,
Thine floats above and is the cream.
Waters above the heavens, what they be,
We are best taught by thy tears and thee.

Every morn from hence
A brisk cherub something sips,
Whose soft influence
Adds sweetness to his sweetest lips;
Then to his music: and his song
Tastes of his breakfast all day long.

These stanzas rise above poetic conceit to poetic allegory, or indeed to pure symbolism. I suspect that any conceit becomes allegory to an imaginative sympathy lively enough to fill in the hiatus and catch the meaning underlying the overbright concreteness. For allegory is always an objectively concrete rendering of

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spiritually apprehended truth; its emphasis of the day-light aspect of things is only apparent. When this emphasis is shifted enough to throw mood into the foreground, dimming objective outlines, we have symbolism. But even here the dramatic form, movement as of facts, is largely retained, though adapted to the needs of metaphor. It is the final victory of lyric impulse over the ethical motive of primitive balladry and represents a last adaptation of the ballad form. I have already named Swinburne and Rossetti as exemplars; perhaps I might also cite Swinburne's *King's Daughter* and Rossetti's *Sister Helen,* not as best instances, but because each of those poems possesses a dual development analogous to that in the curse of Seithenhin. And by comparing the clarity of the major theme, at least in Rossetti's poem, with the mysticism of the refrain, that distinction which I draw between allegory and symbolism may show the clearer. It is the interplay of the two which creates the last appreciation, so that there is contrived that drama of mood which contrasts with lyric movements.

But there is yet another drama of mood, made in another fashion. The development which I have drawn first abstracts the music-form from the dramatic context, and then, casting aside all but verbal melody, evolves an esoteric drama of symbolism. But on the other hand, in Browning's dramatic monologues we attain a not dissimilar end by an opposite course. Here it is the event that is seized upon and installed in dramatic independence. But the poem never exists for the event, the story, nor even for the moral of it. Always it exists for the underimpelling mood. Likely the paradox of a great poet with dramatic instincts failing to achieve great drama is partly to be explained by the fact that Browning's interest did focus so intensely in the mood, the spirit of the thing; the sensuous dress is after all but a dress, and he saw too clearly the naked soul always to catch its pall of flesh and blood with the needful dramatic verve. But he did know the soul's action and adapting to its representation the vivacity of the old ballad he gave us a new poetic form and a new drama of the spirit.

Victorian poetry thus reveals the final appropriation of balladry

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to poetic need. That need, as always, was for the subtler interpretation of human instinct. Passed from the social to the individual nature of man, from the ethical and objective to the spiritual world, it becomes perforce more and more symbolical. This is what I mean by the turn into metaphor. In song we see it in a slow-winning freedom from thralldom of sense; in balladry in the dominance of spiritual over ethical motive; but best it is revealed in that lyric restlessness and poignancy which is the supreme poetic utterance of the age.

VII. THE LYRIC AND MODERNITY

Reflective poetry has so grown upon us of late generations that there is need of a fuller vocabulary of distinctions than is commonly in use. We distinguish adequately enough those forms of gnomic poetry—didactic, satiric, and epigrammatic verse—which deliver sententious sentiment or quizzical philosophizing; but we have no very good term for that more seriously reflective poetry, sometimes elegiac in tone, sometimes idyllic, sometimes, as Khayyam's *Rubaiyat,* light-lipped and hopeless. Poetry of this class verges toward a logical rather than a lyrical order. It lives largely in a realm of knowing, and the knowing is of a spiritual, semi-mystical, gnostic order. Such poetry aims to interpret truth,—stressing both the interpretation and the truth. The interpretation is not mere expression, it is a rendering in the peculiar color of the poet's personality, from an introspective attitude. And the truth is not the brute fact of scientific interests, but it is the vital, human truth of things. This semi-intellectual element is present in pure lyricism, but it does not tyrannize over mood and movement as in the quasi-lyrical forms. There is something of an antipode between poetic philosophizing and the naive utterance of mood; and while both may be fused, as in Wordsworth's *On Intimations of Immortality,* there is much good poetry of the *Locksley Hall* sort in which lyrical form and movement are too thoroughly subordinated to the intellectual leadings of the theme to warrant alignment with the same type. But the distinction must not be made insistent. As quaint Dr. Aitkin notes, the

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Lyric Muse is versatile, "capable of adapting herself to the sprightly and ludicrous, equally with the tender and pathetic," to the even calm of thought as to the fitful flame of passion.

A kind of mental heaviness is, perhaps, the conspicuous characteristic of modern verse (most of all with the best poets)—a heaviness not due so much to the weight of the ideas as to the doubtfulness of the thought: there is lack of conviction, and with it loss of the old poetic buoyancy. In English poetry this is doubtless intensified because of that quality of reserve which is the conspicuous trait of English character. In our tongue we have no "confessions," no soul's day-book, really worth study; and every publication of a great mind's private expression, in letters and the like, induces critical sniffings, as if the thing were indelicate. Puritanism may have been an effect rather than a cause of such instinctive reserve, but it was an effect enhancing in its after-issue the quality that occasioned it: with passing years we have not become less hermit-like. It is asked why America has produced no world-literature, and I venture that a partial answer is the fact that Puritanism took deepest and strongest root in America and especially in that section first to find literary voice. Poetic power is not to be attained without some sacrifice of self, some immolation of spiritual privacy. A comprehension of the New England character portrayed in contemporary prose will yield fair account for our poetic poverty; American genius is still too awkwardly conscious of the soul's garmenting. I imagine that the excess of Walt Whitman's revolt is measure of the effort necessary to the attainment of freedom. Always the danger with the English mind is imaginative dissipation after the barriers are once broken down. We see it in the coarseness of the Restoration, and, in another bent, in those lapses into sentimentalism which sometimes tainted even the finer minds in the early years of last century's romantic revolt.

Yet if repression sometimes weakens, and sometimes, through excessive reaction, leads to fault, it is still the trait which endows our poetry with finest quality in the more perfect attainment. It gives dignity and control, chastity and sweetness, tact in ex-

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pression, and an ineffable grace in diction and imagery. Our poets' best is written in a mode not luminous with the mere sunshine; it hues nature with enchantments more radiant than any wrought by Celtic witchery; it gives to life a finer temper than the iron of the North. Something is embodied from each of these modes, but all is transmuted to the evolved vitality of a new *English* mode. A charm of mystery it has, and a breath of suspense, like childish trepidation lest a too dear caress might crush the wings of beauty,—these, with reverence, as of awe for holy things.

Likely it would be better not to try to illustrate, where illustration is needless; yet sometimes the quoting of a poem which haunts the mind as embalming the essence of the thought will serve to fix even most familiar qualities. In Poe's earlier stanzas *To Helen* the allusion is classical, but the beauty of the poem is not born from the sunny foam of the Mediterranean:

Helen, thy beauty is to me
  Like those Nicean barks of yore,
That gently, o'er a perfumed sea,
  The weary, way-worn wanderer bore
  To his own native shore.

On desperate seas long want to roam,
  Thy hyacinth hair, thy classic face,
Thy Naiad airs have brought me home
  To the glory that was Greece
  And the grandeur that was Rome.

Lo! in yon brilliant window-niche
  How statue-like I see thee stand!
The agate lamp within thy hand!
  Ah! Psyche, from the regions which
  Are Holy Land!

But it is in our poetry of wood and field that we oftenest meet unalloyed the native quality. Perhaps this is because spring-tide rapture and delight in blossoming hedgerows is the oldest lyric instinct of our race. To the ancient Northmen the freeing of the mother of earth's fruitfulness—loveliest of goddesses—from the icy embrace of Fafnir was the great year-joy,—com-

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parable only to the pathetic rapture of the lone Greenland Esquimaux at the Phoenix-birth of the sun after the dead winter months. The token of the Spring set free was the greening turf; and just as the Esquimaux greet the new sun with hymns, so the old Teuton sang springtime in. Nature's kindlier England has but fostered the ancient paganism, till it has come to pass that not any poet of the mother-tongue begins his pilgrimage of minstrelsy save he prologue it with April and with May, some hymn to Spring which is his heart's libation to his native Muse.

And throughout, English poetry is mainly a nature poetry. At the beginning spring and meadow-green, but the whole year gathered into the final song. Storm is there with bird-trill, the doming blue of the sky with the sheltered violet. And all nature is alive, too,—this perhaps from the Celt. The life is not a pantheistic world-vitalism, as with the Brahman, nor anthropomorphic embodiment, as with the classic peoples. The Oriental, realizing human impotence, seeks peace in the tropic seductiveness of spiritual slumber, losing self and its desires in the waste waters of a cosmic sea. The Greek, though well aware of his mortality, effects an ideal conquest of nature; she is no longer mistress, but is ruled by myriad human-like gods and demi-gods, by nymphs and dryads who make her their habitat, by mortals who have conquered mortality; the very vividness of Greek desire compels the seeing of nature enslaved and ruddy flesh triumphantly enthroned. But with our less sunny temper it is otherwise. We have beheld a great vision,—from this our restlessness; but we have found nature jealous of our wish and potent to thwart it,—from this our sadness. Because of our dual derivation, we achieve no contentment. The Celt passionately worships beauty; the Goth clings invulnerably to his personality. Yet without abnegation of self and personal right, beauty cannot be attained. Here is that fundamental contradiction of temperament which gives a sense of tragedy underlying even our gaiety. Especially since Puritanism and Science have in turn cast sobering pall upon the merry-making instinct of the robuster England of the Middle time, the chill and the dread have lain heavy upon

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us. Sometimes we have had mad flyings at the throat of destiny, —Byron's way. Sometimes Saxon fatalism: no Oriental non-resistance, but the nerve-sundering struggle, the fight to the finish of the predestined loser. But again there is a softer mood, perhaps of all most truly characteristic. Contrasted with the classical, in place of light it yields mystery, in place of joy wistfulness, in place of imaginative embodiment aspiration. So Keats,—

> She dwells with Beauty—Beauty that must die;
> And Joy, whose hand is ever at his lips
> Bidding adieu; and aching Pleasure nigh,
> Turning to poison while the bee-mouth sips:
> Ay, in the very temple of Delight
> Veil'd Melancholy has her sovran shrine. . . .

Nature can never again appear pastoral and Arcadian. We have been too well taught that her law is the Survival of the Fittest, her life the Struggle for Existence. And beauty may henceforth never lie in mere sunshine. We have seen afar a more radiant glory transfiguring a loftier world. If we grieve because we cannot reach that world, it is with no mean or selfish grief. Rather it is ache of a fine regret that we cannot be better than we are.

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THE IMAGINARY IN GEOMETRY[1]

BY ELLERY W. DAVIS

Let the point $\tilde{P}$ with complex coördinates

$$\tilde{x} \equiv x' + ix'', \quad \tilde{y} \equiv y' + iy''$$

be represented by a "red vector" joining the ordinary "black point" $(x', y') \equiv P'$ to the "blue point"

$$(x' + x'', y' + y'') \equiv P''.$$

We may conceive the blue point as in a plane of imaginaries in which the origin of coördinates is over (x', y'). Similarly, Maxwell has superposed a velocity diagram upon a position diagram, and upon that an acceleration diagram. It will sometimes be convenient to speak of a "black-vector" from the origin to the black-point from which the red vector begins. Though the vector is understood to be always straight the line which represents it may for convenience be drawn curved. It is essential merely that it go from the proper beginning to the proper end.

2. The coördinates are merely the projections of the vector upon the axes. We can change to new axes rectangular or oblique, leaving the red vector unchanged. We can make the coordinates homogeneous. We can extend the method to space coördinates. All the usual formulæ for transformation will hold,

[1] Portions of this paper have been read as follows: Before the American Mathematical Society, Chicago, April, 1907; Ithaca, November, 1907; Columbia, November, 1909; and before the British Association for the Advancement of Science, August, 1909.

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... real points (x', y') and $(x' + x'', y' + y'')$.
... consider imaginary axes.

... coordinates shifts the ... in direction, but not so ...

... the black ...

... the black ...

tiplies both black and red vectors by the same real number without changing any direction. It is a simple magnification (fig. 3).

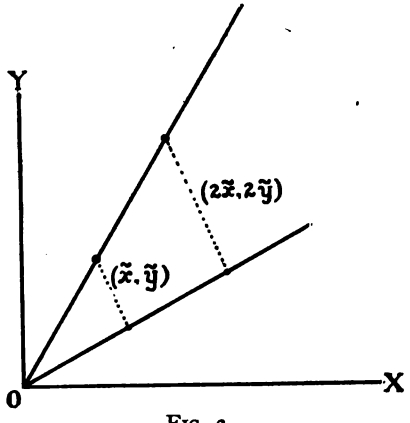

FIG. 3.

The multiplication by a complex number is more complicated. Consider, therefore, first the multiplication of $(1, i)$ by

$$e^{i\theta} \equiv \cos\theta + i\sin\theta.$$

The product is $(\cos\theta + i\sin\theta, i\cos\theta - \sin\theta)$. An inspection of fig. 4 shows that this is merely the double vector of $(1, i)$

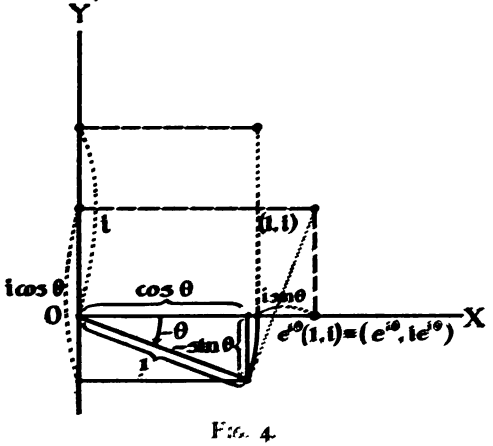

FIG. 4.

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is the x-projection of $(1, i)re^{i\phi}$ When $(1, i)re^{i\phi}$ gets multiplied by $\cos\theta + i\sin\theta$ all parallel projections are so multiplied. Thus $(x' + ix'')e^{i\theta}$ is the x-projection of $(1, i)re^{i(\phi+\theta)}$. If θ varies

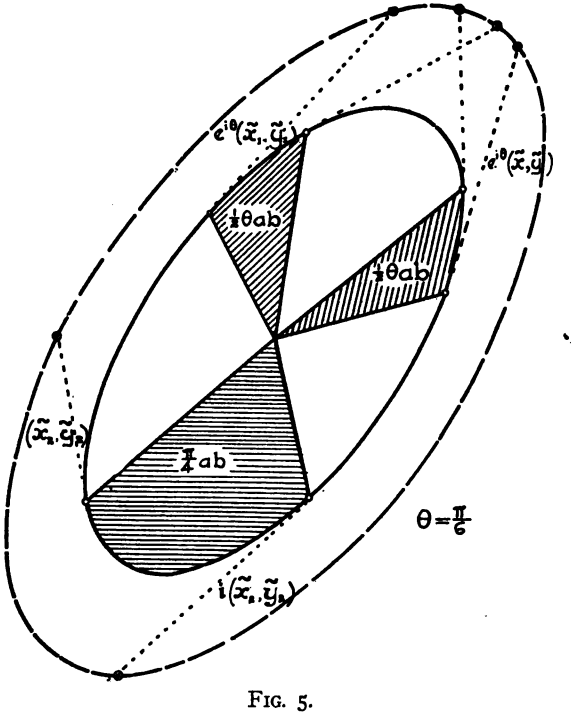

FIG. 5.

uniformly the ends of the red vector of $x' + ix''$ execute simple harmonic motions of amplitudes

$$2\sqrt{x'^2 + x''^2} \text{ and } 2\sqrt{2(x'^2 + x''^2)},$$

the phases differing by $\pi/8$. When $\theta = -\phi$ or $\pi - \phi$, the product $(x' + ix'')e^{i\theta}$ is wholly real; when $\theta = \pi/2 - \phi$ or $3\pi/2 - \phi$ the product is wholly imaginary. Thus the cases of the multiplicand wholly real or wholly imaginary can be treated as sub-cases under what we are now considering.

Suppose that the black vector is finite while the red is infinite. Then, when we multiply by $e^{i\theta}$, the projection, parallel to the red

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vector and upon the black, of the change in the double vector is precisely such a double harmonic motion as we have been describing, the amplitudes being 2 and $2\sqrt{2}$ times the black vector. The projection, parallel to the black vector and upon the red, of this same change is discontinuous, being infinite for a finite variation in θ. While θ varies from 0 to π/a the blue point remains at infinity in the direction of the original red vector. As θ passes π/a the blue point flies from infinity in that direction to infinity in the opposite direction, whither the black point went at the start. Fig. 6 is supposed to represent the facts when $\theta = 0$

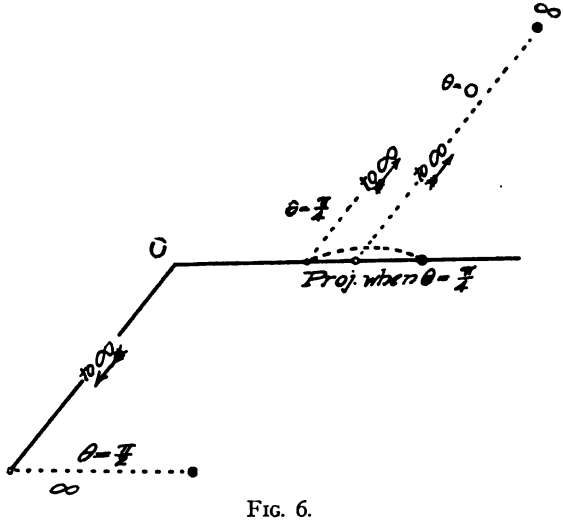

FIG. 6.

and when θ is passing π/a. The dotted line midway between the infinite vectors is the projector of the black point. Both the black point and the blue point stay at infinity until θ passes π, when the black flies from ∞ through the finite position, symmetrical to its original position with respect to O, on to infinity in the opposite direction. Thither also the blue point flies when θ passes $3\pi/2$.

When both parts of the double vector are infinite, neither the blue point nor the black will ever come into the finite field. If

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the θ of the multiplier vary at a finite rate, the projections, upon any line in the finite region, of the end points of the red vector will now one and now the other fly by with infinite velocity.

We shall usually have no occasion to speak of the black vector, for the red vector and the set of complex coördinates are in one-to-one correspondence.

The Linear Relation

When in the equation of the straight line with real coefficients one of the coördinates is complex, the other will usually also be complex. For example,

$$\tilde{y} = m\tilde{x} + b,$$

breaks into

$$y' = mx' + b \quad \text{and} \quad y'' = mx''.$$

Then the red vectors join any point whatever of the line, say P', to any other point P''. In particular if

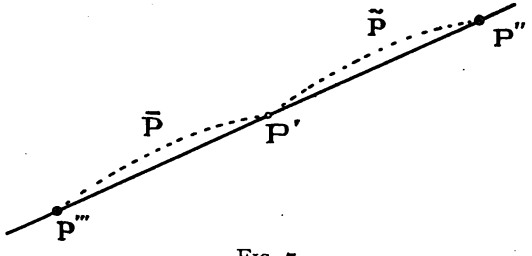

Fig. 7.

$$(\tilde{x}, \tilde{y}) \equiv (x' + ix'', y' + iy'') \equiv \tilde{P},$$

is on the line, so also is the conjugate element,[1]

$$(\bar{x}, \bar{y}) \equiv (x' - ix'', y' - iy'') \equiv \bar{P},$$

and is represented by a red vector from

$$(x', y') \text{ to } (x' - x'', y' - y'') \equiv P'''.$$

Conversely, two conjugate vectors $(\tilde{x}, \tilde{y})$, $(\bar{x}, \bar{y})$ determine a

[1] Element of a locus will be used to mean that whose coordinates satisfy the equation of the locus.

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line their *bearer* the line, namely, through (x', y') with slope y''/x''.

Among the elements of a real line are an infinite number whose imaginary parts are zero. These are the only ones of which we habitually think.

Scarcely more complicated is the line whose slope is real but whose intercept is complex. Let its equation be

$$\tilde{y} = m\tilde{x} + \tilde{b}.$$

This breaks into

$$y' = mx' + b' \quad \text{and} \quad y'' = mx'' + b'',$$

so that the red vectors join any point on the black line to any point whatsoever on the blue line. The line has no real element

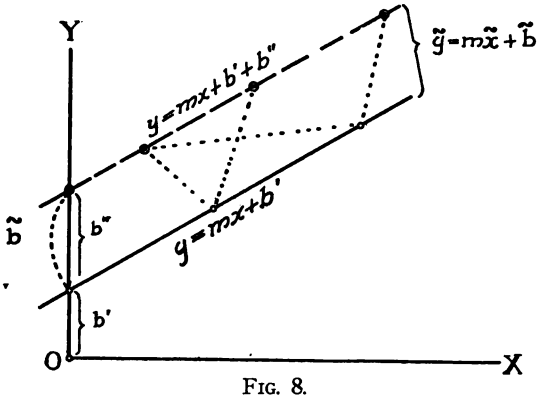

FIG. 8.

in the finite region. Moreover, if a vector be an element, the conjugate vector is not.

Plainly, if the line joining the black points of two red vectors is parallel to that joining the blue points, then the vectors belong to one and the same line of real slope. In particular, two red vectors that agree in their black points or in their blue points belong to such a line.

When blue line coincides with black we get an ordinary real line.

Consider the more general case where $(\tilde{x}_1, \tilde{y}_1)$, $(\tilde{x}_2, \tilde{y}_2)$, call

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them $\tilde{P}_1$ and $\tilde{P}_2$ do not belong to a line of real slope. Let the equation of the line be

$$\tilde{a}\tilde{x} + \tilde{b}\tilde{y} = 1.$$

In this equation, since the line does not have a real slope, we must have

$$\begin{vmatrix} a', & a'' \\ b', & b'' \end{vmatrix} = 0.$$

We say that $\tilde{a}$ and $\tilde{b}$ must not be similar complex quantities.

Since the given vectors satisfy the equation so also does $\tilde{P}_3$ given by

$$(p\tilde{x}_1 + q\tilde{x}_2,\ p\tilde{y}_1 + q\tilde{y}_2), \quad \text{where } p + q = 1.$$

If p and q are real the blue point P_3'' is on the line joining the blue points of P_1'' and P_2'', while the black point P_3' is on the

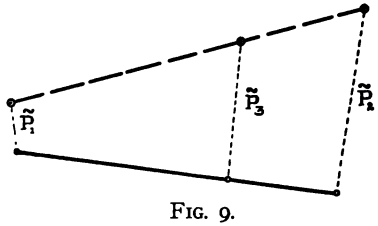

FIG. 9.

line joining the black points P_1' and P_2'. In fact, as p varies from 1 to 0 to ∞ to $-\infty$ to 1 again, the black point describes a black line and the blue point a corresponding blue line, so as always to keep the segment of these lines included between the vectors $\tilde{P}_1$ and $\tilde{P}_2$ divided in the ratio[1] $q : p$. We can say that the double segment of the line $\tilde{P}_1\,\tilde{P}_2$ is divided in the ratio $q : p$.

Suppose, however, that the ratio in which we divide the line is complex $\tilde{q} : \tilde{p}$. We can so take $\tilde{p}$ and $\tilde{q}$ that $\tilde{p} + \tilde{q} = 1$ and therefore $p' + q' = 1$ and $p'' + q'' = 0$. The division will then be found connected with that in the ratios of $q' : p'$ and $q' + q'' :$

[1] The row of blue points is projective to the row of black ones, but in addition the infinite points of the rows are corresponding. Thus the rows are similar.

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$p' + p''$. These divisions are represented in fig. 10 by $\tilde{P}_3$ and $\tilde{P}_4$ respectively. Reflect that the black line-segment represents

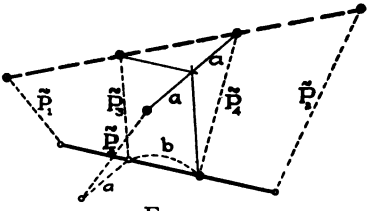

FIG. 10.

the growth in the black vector, as keeping real, *i. e.*, black, it changes from the black vector of $\tilde{P}_1$ to that of $\tilde{P}_2$, while the blue line-segment represents the corresponding growth in the double-vector, the sum of the growths of the constituent vectors.

When instead of division in the ratio of $q' + q'' : p' + p''$ we have that in the ratio $\tilde{q} : \tilde{p}$ each of these growths is divided in that ratio. Thus, instead of the black growth from $\tilde{P}_3$ to $\tilde{P}_4$ we have a red-growth which will therefore change the red vector, while instead of the red change in the vector from that of $\tilde{P}_3$ to that of $\tilde{P}_4$ we shall have an opposite black change. The resultant red vector is $\tilde{P}_5$. In the figure the vectors marked a are each equal to $\tilde{P}_3 - \tilde{P}_4$ while $\tilde{P}_5$ is equal to $\tilde{P}_3 + b$.

Any point in the plane is the black end of a red vector dividing the line connecting two vectors in some ratio or other. For let the vectors be $\tilde{P}_1$, $\tilde{P}_2$. Join their black points by a black line

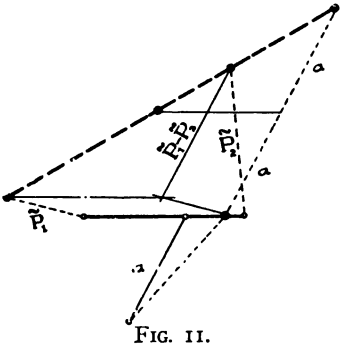

FIG. 11.

and their blue points by a blue line, and from the arbitrary point in the plane draw a black vector in the direction $\tilde{P}_1 - \tilde{P}_2$, or its

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opposite, until the black line $P_1' P_2'$ is met. Divide the blue line $P_1'' P_2''$ in the same ratio as the black line is thus divided. From the point of division of the blue line draw a parallel to the black to a point such that a black vector from it equal to that from the arbitrary point will just reach the blue line. This vector reversed will give the blue point that goes with the arbitrary black point to determine the red vector required. Fig. 11 illustrates this construction. Similarly, we can start with any point in the plane for a blue point.

Return to the equation $\tilde{a}\tilde{x} + \tilde{b}\tilde{y} = 1$. This is equivalent to the pair

$$a'x' + b'y' - a''x'' - b''y'' = 1,$$
$$a'x'' + b'y'' + a''x' + b''y' = 0.$$

These show very plainly that there is a one-to-one correspondence between black points and blue points, provided

$$\begin{vmatrix} a', & b' \\ a'', & b'' \end{vmatrix} \neq 0.$$

In particular, let $x'' = y'' = 0$, so that the blue point coincides with the black. This will give a point $(x_0, y_0) = P_0$, whose red vector vanishes. We get, in fact,

$$x_0 = \frac{b''}{a'b'' - a''b'}, \quad y_0 = \frac{-a''}{a'b'' - a''b'}.$$

When the denominator vanishes, but at least one numerator does not, P_0 goes to infinity. We have in fact the case of a line of real slope. If a'' and b'' both vanish the line is real and P_0 is indeterminately any point whatever on the line. Note in these cases, that, although $x'' = y'' = 0$ gives the point P_0 with coordinates as above, yet to assume coordinates as above for a black point leaves the blue point to go with it indeterminate.

The point P_0 we call the center of the line. When it goes to infinity or becomes indeterminate we say that the line is *non central*.

Given two red vectors $\tilde{P}_1$ and $\tilde{P}_2$ (fig. 12) to construct the center P_0 of the line to which they belong, proceed as follows: Draw the black line and the blue line joining them. The vector

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$\tilde{P}_3$ belonging to the line $\tilde{P}_1\,\tilde{P}_2$ whose blue point is at the crossing of blue line and black line has its black point on the black line at the distance l equal to the projection parallel to $\tilde{P}_1\,\tilde{P}_2$ of $\tilde{P}_1$ and $\tilde{P}_2$ upon the black line. Moreover, this point bisects the

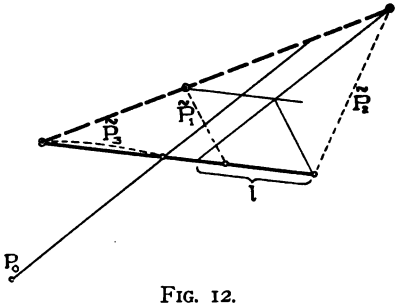

FIG. 12.

line drawn from the center P_0 we seek and terminated by the blue line.

Fig. 13 illustrates how given the center P_0 and a red vector $\tilde{P}_1$ we can construct other vectors $\tilde{P}_2$ and $\tilde{P}_3$.

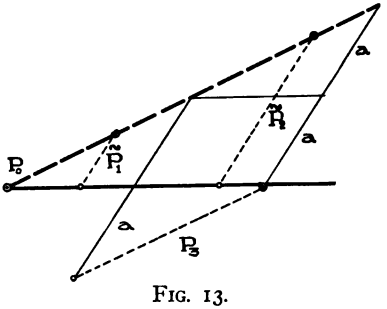

FIG. 13.

To see more clearly and comprehensively the character of the central line consider the special line

$$\tilde{y} = i\tilde{x},$$

whose center is the origin.

At once

$$y' = -x'' \quad \text{and} \quad y'' = x'.$$

Hence the red vector is at right angles to the black vector from

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the origin and has the same length. If the red vector be taken for a velocity then the equation represents a rotation of the entire

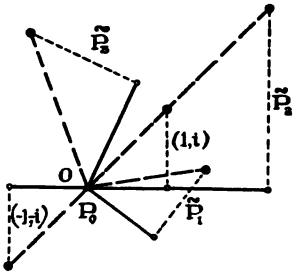

FIG. 14.

plane about the origin as center at the angular rate positive unity. When $\tilde{y}=i\tilde{x}$ then $\bar{y}=-i\bar{x}$, so that the conjugate vector belongs to the conjugate line $\tilde{y}=-i\tilde{x}$.

The lines

$$(\tilde{y}-b)=i(\tilde{x}-a) \text{ and } (\tilde{y}-b)=-i(\tilde{x}-a),$$

also conjugate, differ from the foregoing only in having their center at (a, b). The pair together form the point circle

$$(\tilde{x}-a)^2+(\tilde{y}-b)^2=0.$$

All such pairs of lines cut the line at infinity[1] in the same two "circular vectors at infinity." We call each line a "circular ray." Moreover we denote the vector at infinity when the slope is $+i$ by $\tilde{I}$, when $-i$ by $\tilde{J}$.

Every other central line is elliptic, is a parallel projection of a circular ray.

It suffices to prove this for

$$\tilde{y}=re^{i\phi}\tilde{x}.$$

If we multiply both sides of the equation by $e^{i\theta}$ it remains satisfied, *i. e.*, $e^{i\theta}(\tilde{x}, \tilde{y})$ satisfies the equation if $(\tilde{x}, \tilde{y})$ does. But we have already seen that the red vector $e^{i\theta}(\tilde{x}, \tilde{y})$ is tangent to the same ellipse that $(\tilde{x}, \tilde{y})$ is and that its blue point is on the

[1] To fix the ideas we think of $x=\infty$ as the line at infinity.

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same coaxial and similar blue ellipse. All the red vectors belonging to the line have the like relation to a pair of ellipses coaxial and similar to these. The motion set up is elliptic and

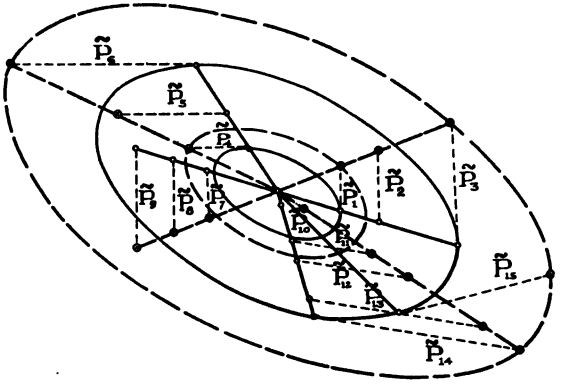

FIG. 15.

compounded of simple harmonic motions parallel to conjugate diameters of the ellipses; that is, parallel to a red vector and the corresponding black vector from the center of the line (see Fig. 15). For all values of a and b

$$\tilde{y} - b = re^{i\phi}(\tilde{x} - a)$$

has the same elliptic vector at infinity. The conjugate line

$$\tilde{y} - b = re^{-i\phi}(\tilde{x} - a)$$

has its vectors tangent to the same ellipses. The pair together give the point ellipse

$$\tilde{y} - b + (\tilde{x} - a)\cos\phi)^2 + r^2(x - a)^2 \sin^2\phi = 0;$$

for the two can be written

$$(\tilde{y} - b) - r(\tilde{x} - a)\cos\phi = ir(x - a)\sin\phi,$$
$$(\tilde{y} - b) - r(\tilde{x} - a)\cos\phi = -ir(x - a)\sin\phi.$$

We now perceive that to multiply the coördinates of a red vec-

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tor, as of an ordinary point, is merely to move it so that it always remains upon the line determined by itself and the origin.

It is interesting to observe how a line of imaginary slope passes over into one of real slope as the center moves out to infinity. For example, consider

$$y = \frac{i}{k}(x+k)$$

approaching

$$y = i,$$

as k becomes infinite.

For all values of k the vector $(0, i)$ belongs to the line. This vector is tangent to the ellipse

$$\frac{(x+k)^2}{k^2} + y^2 = 1,$$

and has its blue point on

$$\frac{(x+k)^2}{k^2} + y^2 = 2.$$

Moreover, all vectors drawn from tangency to the first ellipse and terminated by the second belong to the line or its conjugate.

Indeed, all vectors belonging to the line are drawn from tangency to some ellipse

$$\frac{(x+k)^2}{k^2} + y^2 = \left(1 + \frac{l}{k}\right)^2$$

with axes $k+l$ and $1 + k/l$, and terminated by

$$\frac{(x+k)^2}{k^2} + y^2 = 2\left(1 + \frac{l}{k}\right)^2$$

with axes $(k+l)\sqrt{2}$ and $\left(1 + \frac{k}{l}\right)\sqrt{2}$.

Among these is the vector $\left[l, i\left(1 + \frac{l}{k}\right)\right]$. Thus for all values of k and of l the vector $\left[l, i\left(1 + \frac{l}{k}\right)\right]$ belongs to the line. As k becomes large this becomes more and more nearly (l, i) which belongs to $y = i$.

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of the ray, the distance between the elements represented is zero. Similarly, the distance between any two elements of a J-ray is zero.[1] If an I-ray and a J-ray have the same center, we have the paradox that although no element of either has any distance from the center, yet the distance of an element of one ray from an element of the other is the square root of the product of the arrow lengths for the elements into the exponential of i times half the angle between them.

A very simple construction can be given for the distance from the origin of (x', iy''), axes being rectangular. Fig. 18 represents the cases

$$|y_1''| < |x'|, \quad |y_2''| = |x'|, \quad |y_3''| > |x'|.$$

Here

$$l_1 = |x' + y''|, \quad l_2 = |x' - y''| \quad \text{and} \quad \phi = l_1 l_2 = 0,\ 0/0,\ \pm\pi.$$

In the first case d_1 is the tangent from the origin to the circle of center P' and radius y_1'', in the second case $d_2 = 0$; in the third

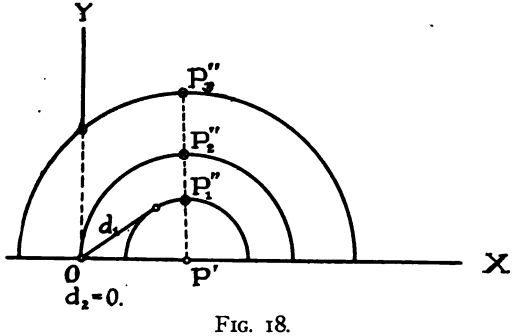

FIG. 18.

case $|d_3|$ is the half intercept on the y-axis of the circle of center P' and radius y_3''. The second case represents a transition from a wholly real to a wholly imaginary distance.

The distance from one of the three given elements to another of them is wholly imaginary; from (x', iy_1'') to (x', iy_2'') it is, for example, $i(y'' - y_1'')$. In general, to find the distance from any element of a real line to any other element of that line we subtract the coördinates of the first element from those of the second

[1] The case where an element is I or J requires special treatment.

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measured along the line as axis from any point thereof as origin.

Nor is the construction of the complex distance from a real point O to a red vector $\tilde{K}$ at all difficult. This is shown in fig. 19. The distance is $\tilde{d} = d' + id''$, where of course d' and d'' are

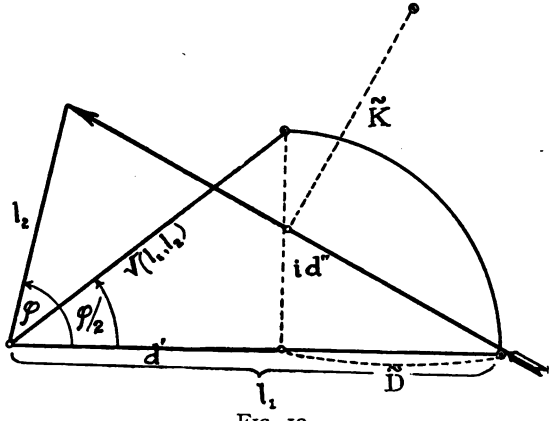

FIG. 19.

measured in the same direction. Thus the distance to the vector K is the same as that to the vector $\tilde{D}$. The construction of the distance from a vector $\tilde{K}$ to a vector $\tilde{M}$ is given in fig. 20. The

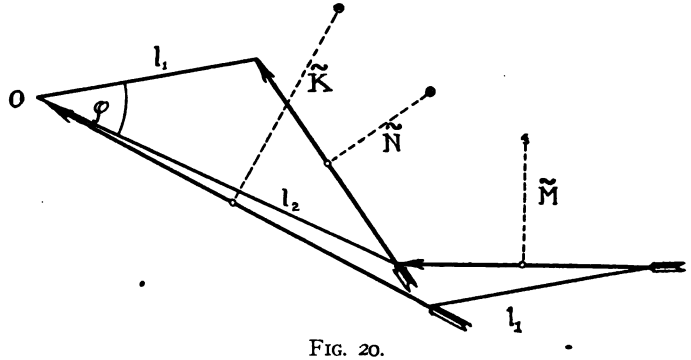

FIG. 20.

distance is the same as that from O to $\tilde{N}$. The paradox is to be noted that although the distance from O to $\tilde{K}$ is nothing, yet the distance $O\tilde{M}$ differs from the distance $\tilde{K}\tilde{M}$.

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From the formula and the construction for the distance between two points we can derive that for the distance from a line to a point. We have only to pass through the point a line perpendicular to the given line, find where this intersects the given line and then get the distance between the given point and this point of intersection. If the line, referred to rectangular axes be

$$\tilde{a}\tilde{x} + \tilde{b}\tilde{y} + \tilde{c} = 0,$$

while the point is $(\tilde{x}_1\ y_1)$ this will be found to give for the distance desired

$$\frac{\tilde{a}\tilde{x}_1 + \tilde{b}\tilde{y}_1 + \tilde{c}}{\sqrt{\tilde{a}^2 + \tilde{b}^2}}$$

Suppose that referred to rectangular axes through O, the center of the line, the equation becomes

$$\tilde{y} = e^{i\phi}\tilde{x}.$$

Then O with $(1,\ e^{i\phi})$ determines the line. Similarly O with

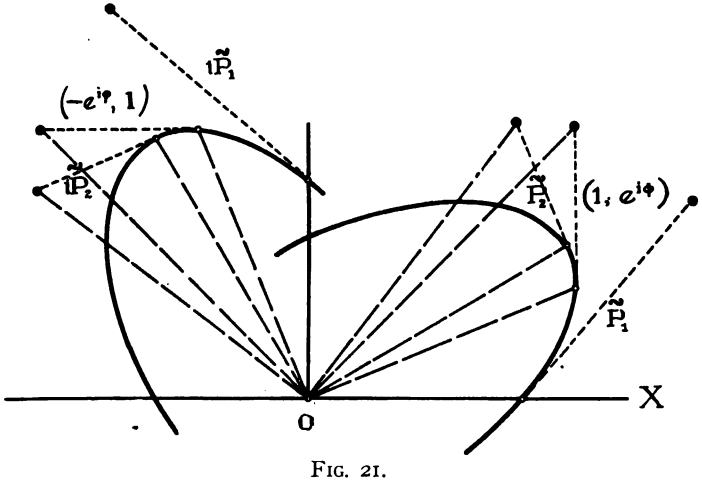

FIG. 21.

$(-e^{2\phi},\ 1)$ determines a line related to axes $\bar{O}\bar{Y}$ and the opposite of OX precisely as the above line is to OX, and OY; the line,

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in fact,

$$\tilde{x} = -e^{i\phi}\tilde{y} \text{ (see fig. 21)}.$$

If the first line, with all its elements, be rotated positively through a quadrant, any element $(\tilde{x}, \tilde{y})$ will be brought into coincidence with the element $(\tilde{y}, -\tilde{x})$ belonging to the second. We are led then to the following definition.

Two lines having the same center are perpendicular if by a rotation of one of them through a quadrant it can be brought into coincidence with the other. In particular, an I-line or a J-line is perpendicular to itself. Similarly, two lines are parallel if by a shift without turning one can be brought wholly into coincidence with the other. In particular, two I-lines are parallel as are also two J-lines.

Two lines not having the same center are perpendicular if one is parallel to or perpendicular to the other. In particular, two I-lines are perpendicular as are also two J-lines.

In fact, two I-lines make any real angle you please with each other, since an I-line comes into coincidence with itself for any turn whatsoever. The same is true of two J-lines. Analytically, if

$$y = \pm ix,$$

then also

$$x \sin\phi - y\cos\phi = \pm i(x\cos\phi - y\sin\phi).$$

By no real shift and turn can an I-line be brought into coincidence with a J-line. No more can a line of slope $e^{i\phi}$ be so brought into coincidence with one of slope $e^{-i\phi}$ when both ϕ and ϕ_1 lie between 0 and π. If the red vectors corresponding to elements of the one so lie that to one looking along them the center of the line is on the left, then for the vectors belonging to the other the center is on the right. It is, indeed, an exception when one imaginary line can by a real turn be brought into coincidence

$$y = \tilde{m}x \quad \text{and} \quad y = \tilde{n}x,$$

the tangent of the angle through which the left one must be turned

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to come into coincidence with the right is

$$t = \frac{\tilde{n} - \tilde{m}}{1 + \tilde{m}\tilde{n}}.$$

which is usually complex.

Return then to our problem, the distance from a point

$$(\tilde{x}_1, \tilde{y}_1) \equiv \tilde{P}_1 \quad \text{to} \quad y = e^{i\phi} x.$$

The perpendicular line though $\tilde{P}_1$ is $\tilde{x} - \tilde{x}_1 = e^{i\phi}(\tilde{y} - \tilde{y}_1)$ and the distance sought is

$$\tilde{d} = \frac{y_1 - e^{i\phi} x_1}{\sqrt{1 + e^{2i\phi}}}.$$

If the line is a circular ray the denominator vanishes and the distance becomes infinite unless the numerator vanishes also, that is, unless $\tilde{P}_1$ is upon the ray. To see this otherwise, note that the perpendicular to an I-ray through any point is an I-ray. If the point is on the first ray it is of course no distance from it. If

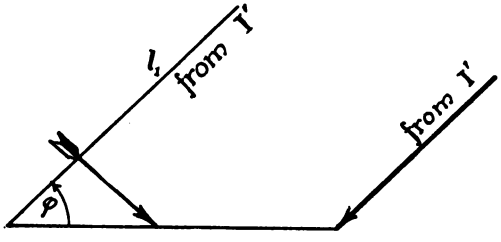

FIG. 22.

the point is not on the ray it is necessary to go along the perpendicular until $\tilde{I}$ itself, common to the two rays, is reached. This is an infinite distance as the construction in fig. 22 shows. In particular, suppose the point is $(2, i)$ the I-ray through it is

$$\tilde{y} = i(\tilde{x} - 1)$$

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and is perpendicular to $\tilde{y}=i\tilde{x}$ through the origin. I or $(\infty, i\infty)$

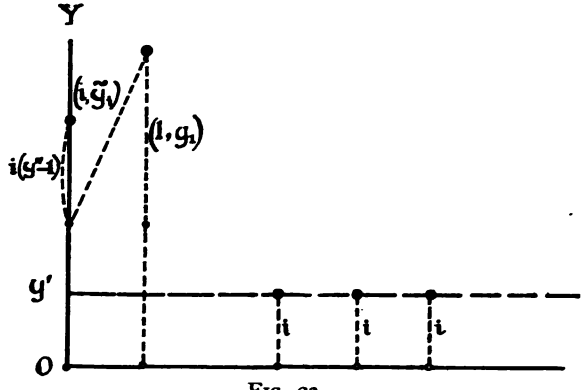

FIG. 23.

is their common point the distance of which from $(2, i)$ is

$$\underset{x=\infty}{L}\sqrt{(x-2)^2-(x-1)^2}=L\sqrt{-3x+3}=\infty i$$

When the line is of real slope, the perpendicular to it through any element, *i. e.*, any red vector, also has real slope. The distance has for its real part the distance from the black point of the red vector to the black line of the line of real slope while the imaginary part will be the difference of the projections upon the perpendicular of the given red vector and the red vector of the intersection. Thus from $y=i$ to $(\tilde{x}, \tilde{y})$ the distance is

$$+y'+i(y''-1).$$

The distance from one red vector to another can be represented in terms of the distances along two lines of real slope, one through each vector. Thus in fig. 24,

$$\begin{aligned}\tilde{A}\tilde{C}^2 &= \tilde{A}\tilde{B}^2+\tilde{B}\tilde{C}^2+2\tilde{A}\tilde{B}\cdot\tilde{A}\tilde{C}\cos\omega\\ &= \tilde{A}\tilde{E}^2+\tilde{E}\tilde{C}^2+2\tilde{A}\tilde{E}\cdot\tilde{E}\tilde{C}\cos\phi.\end{aligned}$$

In the last member $\tilde{E}\tilde{C}$ is a pure imaginary $=ik$ say. Taking coördinates as indicated,

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$$\tilde{A}\tilde{C}^2 = (x_e' + ix_e'')^2 - k^2 + 2i(x_e' + ix_e'')\, k \cos\phi$$
$$= x_e'^2 - m^2 + 2ix_e' k \cos\phi.$$

If the lines of real slope through $\tilde{A}$ and $\tilde{C}$ are drawn at right angles $\tilde{B}$ will be an element of a circle on $\tilde{A}\tilde{C}$ as diameter. All the elements gotten in this way will have their black points on a circle of diameter x_e' and their blue points on a circle of diameter

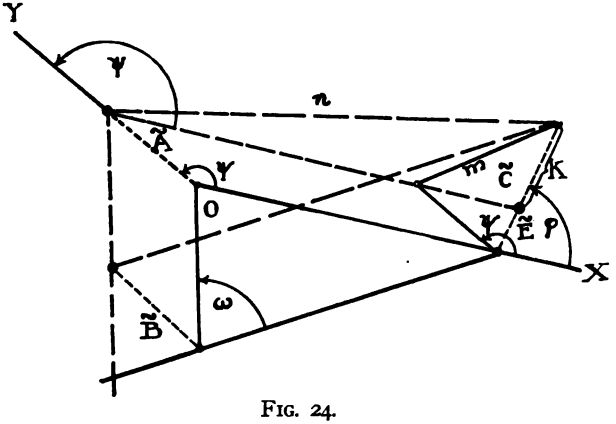

FIG. 24.

n. Other elements are obtained by the intersection of lines of imaginary slope passing through $\tilde{A}$ and $\tilde{C}$. In particular, the circular rays through $\tilde{A}$ and $\tilde{C}$ intersect in $\tilde{I}$ and $\tilde{J}$ and two other points. The locus of all such points is, in general, a circle of complex radius and complex center.

AREA

The area of a triangle whose vertices are $\tilde{P}_1$, $\tilde{P}_2$, $\tilde{P}_3$ is, coördinates being rectangular,

$$\tfrac{1}{2}\begin{vmatrix} \tilde{x}_1, & \tilde{y}_1, & 1 \\ \tilde{x}_2, & \tilde{y}_2, & 1 \\ \tilde{x}_3, & \tilde{y}_3, & 1 \end{vmatrix}.$$

In case $\tilde{P}_1$, and $\tilde{P}_2$ are on the line $\tilde{y} = \tilde{m}\tilde{x} + \tilde{b}$ this becomes

$$\tfrac{1}{2}(\tilde{m}\tilde{x}_3 + \tilde{b} - \tilde{y}_3)(\tilde{x}_1 - \tilde{x}_2).$$

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Here the expression in the first parenthesis is the distance from $\tilde{P}_3$ to the line $\tilde{P}_1\tilde{P}_2$ multiplied by $\sqrt{(1+\tilde{m}^2)}$, while $\tilde{x}_1 - \tilde{x}_2$ is the distance $\tilde{P}_1\tilde{P}_2$ divided by $\sqrt{(1+\tilde{m}^2)}$. Evidently the triangle is finite and not zero if the vertices all lie in the finite region and are non-collinear. In particular, suppose the points are $(0, 0)$, $(1, i)$, $(2, i)$, of which the first two are on a circular ray at no distance from each other, but at an infinite distance from the third; the area is $-i/2$. This may be verified by noticing that the last two are on $y=i$, which is distant i from $(0, 0)$.

Fig. 25 shows how the area is made up in the general case. The real part is the triangle $P_1'P_2'P_3' + 3$ quadrilaterals of the

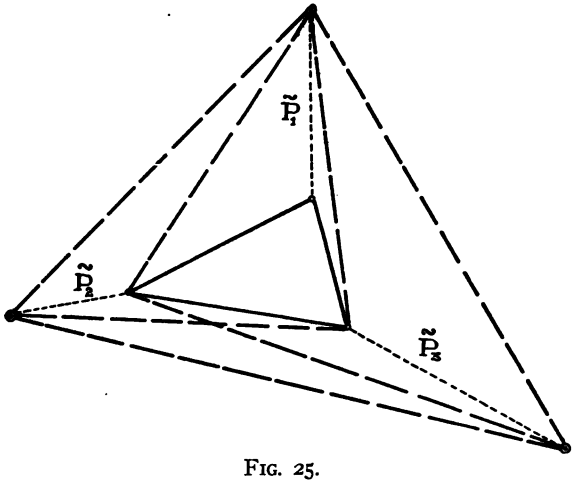

FIG. 25.

type $P_3'\tilde{P}_2\tilde{P}_3P_2'$. The imaginary part is the sum of three quadrilaterals of the type $P_2'P_1'P_3'\tilde{P}_1$. The area of $P_3'\tilde{P}_2\tilde{P}_3P_2'$ is the opposite of that of $P_3'P_2''P_3''P_2'$, which is

$$\tfrac{1}{2}(x_2''y_3'' - x_3''y_2'').$$

Thus the sum of the three areas of the type is

$$-\tfrac{1}{2}\begin{vmatrix} x_1'' & y_1'' & 1 \\ x_2'' & y_2'' & 1 \\ x_3'' & y_3'' & 1 \end{vmatrix};$$

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the area of $P_2'P_1'P_3'P_1$ is i times that of $P_2'P_1'P_3'P_1''$ which is $\frac{1}{2}\{(x_3'-x_2')y_1''-x_1''(y_3'-y_2')\}$. Thus the sum of the three areas of the type is

$$\frac{i}{2}\begin{vmatrix} x_1' & y_1'' & 1 \\ x_2' & y_2'' & 1 \\ x_3' & y_3'' & 1 \end{vmatrix} + \frac{i}{2}\begin{vmatrix} x_1'' & y_1' & 1 \\ x_2'' & y_2' & 1 \\ x_3'' & y_3' & 1 \end{vmatrix}.$$

It can be verified geometrically that in case P_1, P_2, and P_3 all belong to the same circular ray both the real and the imaginary parts of the triangle area vanish. By parallel projection it then follows that the area vanishes when the three vertices all belong to the same elliptic line.

The Circle

We consider first

$$\tilde{x}^2+\tilde{y}^2=1,$$

with its circle of black points $x'^2+y'^2=1$.

Suppose that $x'>1$ and $x''=0$, then

$$y'=0 \text{ and } y''=i\sqrt{(x'^2-1)}.$$

Thus, as the black point of a red vector belonging to the circle describes the x-axes, the blue point describes a blue rectangular hyperbola, a supplementary curve to the circle.[1] Moreover, since a revolution of the axes, keeping them rectangular, does not alter the equation of the circle, there is such an hyperbola tangent to every point of the black circle and coincident with a revolved position of this hyperbola. The black circle separates the part of the plane where elements of the circle exist from the part where they do not.

$$(\tilde{x}-a)^2+(\tilde{y}-b)^2=r^2,$$

differs from the case just considered only by a magnification by r and a shift of center to (a, b).

As Poncelet[2] long ago showed, they all pass through I and J,

[1] Poncelet, Traité des Propriétés Projectives, p. 29.

[2] Poncelet, Traité, p. 48.

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In fig. 26 the Q's are elements of the circular rays through O. Moreover, the circular rays through the center of each are tangent to that one, the points of contact being $\tilde{I}$ and $\tilde{J}$. The point of contact of a tangent from within the black circle will always be a red vector. Thus the tangent from P_0 (fig. 26) has the point of contact P_2 and is the line determined by P_0 and $\tilde{P}_2$. The blue

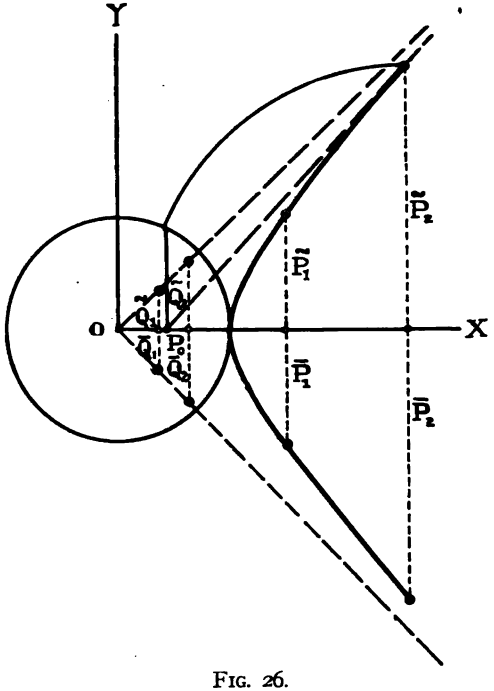

FIG. 26.

line from P_0 to P_2'' is tangent to the hyperbola through P_2''. The points P_0 and P_2' are a pair of points inverse with respect to the circle, and the distance from one to the other is double the red vector which bisects that distance. Thus, in Cauchy's representation, arrows join every point of the plane to the inverse point with respect to the circle.

Closely related to $x^2 + y^2 = 1$ is the purely imaginary circle $x^2 + y^2 = -1$.

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This gives for $x''=0$, $y''=i\sqrt{(1+x'^2)}$ so that (x', y'') lies on a rectangular hyperbola but the red elements are now parallel to the real axis of that hyperbola. As before, revolution about the center gives us the other red vectors, in particular, all the red radii of the blue circle enveloped by the hyperbolas. To any real

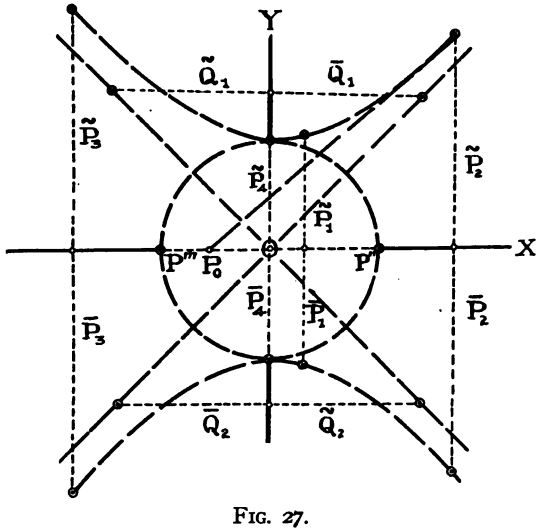

FIG. 27.

point P_0 there is an imaginary point of tangency represented by a red vector, say P_2. The black point on this is inverse to the point P_0 with respect to the imaginary circle. As in the other case the arrow joining two inverse points represents an imaginary point on the circle, the same point namely as that represented by the red vector whose black point is the mid-point of the arrow and which lies to the right of one looking along the arrow toward the barb. As before the circular rays through the center are tangent at $\tilde{I}$ and $\tilde{J}$ and the $\tilde{Q}$'s are elements of them (see fig. 27).

Consider the more general case

$$\tilde{x}^2+\tilde{y}^2=\tilde{a}^2,$$

equivalent to

$$x'^2+y'^2=a'^2+k, \qquad (1)$$

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$$x''^2 + y''^2 = a''^2 + k, \tag{2}$$

$$x'x'' + y'y'' = a'a'' \tag{3}$$

where k is real. Moreover, since the equations give

$$(a'^2 + k)x'' = a'a''x' \pm y'\sqrt{k(k + a'^2 + a''^2)},$$
$$(a'^2 + k)y'' = a'a''y' \mp x'\sqrt{k(k + a'^2 + a''^2)},$$

k is positive.

When the black point of a red vector lies upon (1) the blue point $(x' + x'', y' + y'')$ lies upon

$$x^2 + y^2 = (a' + a'')^2 + 2k,$$

while the vector has the length given by (2).

Fig. 29 represents $\tilde{x}^2 + \tilde{y}^2 = (1 - i)^2$. For $k = 0, 1, 3, 8$ the

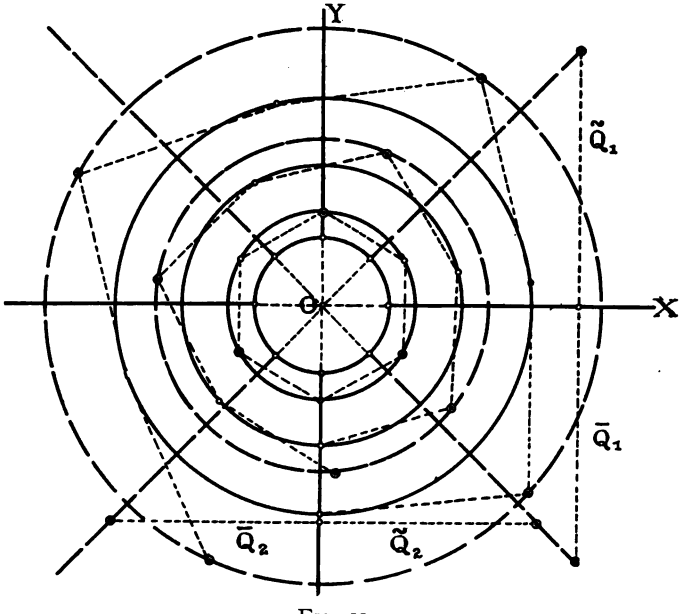

FIG. 29.

radius of the black circle is respectively 1, $\sqrt{2}$, 2, 3 while that of the corresponding blue circle is e, $\sqrt{2}$, $\sqrt{6}$, 4. Eventually, when

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k becomes infinite, the red vector becomes tangent to the black circle, becomes, in fact, either I or J. The Q's belong to the circular rays; all the other red elements belong to the circle.

Perhaps a better way of treating this case is the following:

The red vectors collinear with the origin and connecting the black circle

$$x^2 + y^2 = x'^2 + y'^2 = a'^2$$

to the blue circle

$$x^2 + y^2 = (x' + x'')^2 + (y' + y'')^2 = (a' + a'')^2,$$

evidently satisfy the equation. Let us look upon this double circle as the fundamental curve.

Then

$$x^2 - y^2 = x_1'^2 - y_1'^2 = a'^2$$

and

$$x^2 - y^2 = (x_1' + x_1'')^2 + (y_1' + y_1'')^2 = (a' + a'')^2,$$

form together the supplementary curve $\tilde{x}_1^2 - \tilde{y}_1^2 = \tilde{a}^2$. That is to say, a curve such that, if the ordinates be multiplied by i, leaving the abscissas unchanged, the resulting double-vectors satisfy

$$\tilde{x}^2 + \tilde{y}^2 = \tilde{a}^2.$$

This gives

$$y' = -y_1'', \; y'' = y_1'.$$

Now just as vectors radial from the origin satisfy the fundamental curve so do such vectors satisfy the supplementary curve. And just as on the fundamental curve

$$\frac{x''}{x'} = \frac{y''}{y'} = \frac{a''}{a'},$$

so also on the supplementary does

$$\frac{x_1''}{x'} = \frac{y_1''}{y_1'} = \frac{a''}{a'}.$$

Therefore

$$(x', y') \equiv (x_1', -y_1'') \equiv \left(x_1', -\frac{a''}{a'} y_1'\right)$$

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and lies upon

$$x^2 - \frac{a'^2}{a''^2} y^2 = 1,$$

while

$$(x' + x'',\ y' + y'') \equiv (x_1' + x_1'',\ -y_1'' + y_1')$$
$$\equiv \left(x_1' + x_1'',\ \frac{a' - a''}{a' + a''}(y_1' + y_1'')\right)$$

and lies upon

$$x^2 - \left(\frac{a' + a''}{a' - a''}\right)^2 y^2 = 1.^1$$

In the particular example

$$\tilde{x}^2 + \tilde{y}^2 = (1 - i)^2$$

these, so to speak, *companions* to the supplementary curve are

$$x^2 - y^2 = x'^2 - y'^2 = 1,$$

and

$$x^2 - 0y^2 = (x' + x'')^2 - 0(y' + y'')^2 = 0,$$

i. e.,

$$x^2 = (x' + x'')^2 = 0.$$

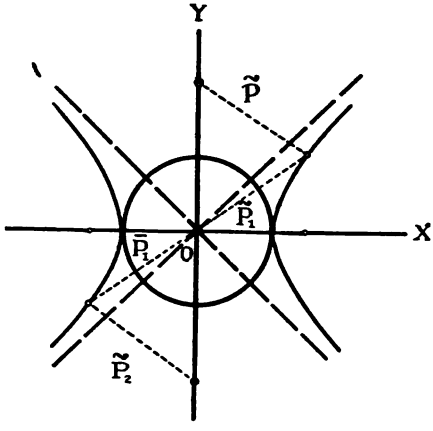

FIG. 28.

[1] The vector $\tilde{P} \equiv (\tilde{x},\ \tilde{y})$ is normal to the first companion curve. Cauchy's corresponding vector is tangent to the same and is terminated by the asymptotes.

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By merely revolving the figure we then get all the other supplementary curves and their companions. In fig. 28 $\tilde{P}_1$ and $\bar{P}_1$ are elements of the supplementary curve while $\tilde{P}$ and $\bar{P}$ belong to the companion pair, that is, therefore, to

$$\tilde{x}^2 + \tilde{y}^2 = (1 - i)^2.$$

All the types of circles considered have had a real center. It is only necessary to make an imaginary shift to transform them into circles with imaginary centers. For convenience, let the shift of amount il be made parallel to the x-axis. The circle of complex radius $\tilde{a}$ then becomes

$$(\tilde{x} - il)^2 + \tilde{y}^2 = \tilde{a}^2.$$

Every point satisfying $\tilde{x} + \tilde{y}^2 = \tilde{a}^2$ is changed by a red vector il parallel to the x-axis. As a result of the changes only two points can be real; those namely, if such exist, which satisfy

$$x'^2 + y'^2 = a'^2 + l^2 - a''^2$$

$$-lx' = a'a''.$$

These give

$$y'^2 = (a'^2 + l^2)\left(1 - \frac{a''^2}{l^2}\right),$$

and therefore, for a real point,

$$l^2 \geq a''^2.$$

Fig. 30 illustrates $(\tilde{x} - il)^2 + \tilde{y}^2 = 1$. S and T are the real points, Q and R are the centers of the circular rays through the center $\tilde{O}$ of the circle.

The completion of the circle $\tilde{x}^2 + \tilde{y}^2 = 1$ by the introduction of its complex points enables us to extend our notions of an angle and its functions. The angle $\tilde{\theta} \equiv \theta' + i\theta''$ is represented by the black circular sector (fig. 31) of area $\theta'/2$ together with the red hyperbolic sector of area $i\theta/2$ whose initial line is the terminal line of the black sector. The functions $\cos \tilde{\theta}$ and $\sin \tilde{\theta}$ are merely the coördinates of the red vector $\tilde{P}$. We have, in fact, directly

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from the figure

$$\cos\tilde{\theta} = \cos\theta' \operatorname{ch}\theta'' - i\sin\theta \operatorname{sh}\theta',$$
$$\sin\tilde{\theta} = \sin\theta' \operatorname{ch}\theta'' + i\cos\theta \operatorname{sh}\theta',$$
$$\tan\tilde{\theta} = \frac{\tan\theta' + i \operatorname{th}\theta''}{1 - i\tan\theta' \operatorname{th}\theta''}$$

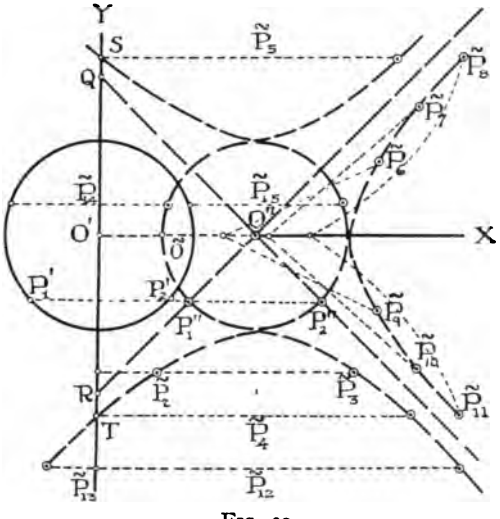

FIG. 30.

Note that $\tan^{-1} i = i \operatorname{th}^{-1} 1 = i\infty$ the imaginary part of the angle that the I-ray makes with x-axis. Note also that

$$\tan^{-1} ki = \pi/2 + \tan^{-1} i/k.$$

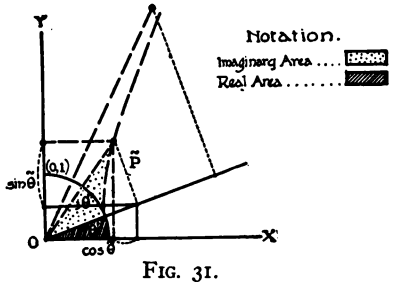

FIG. 31.

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In particular,

$$\tan^{-1}\infty i = \pi/2 = \tan^{-1}\infty = \tan^{-1}(\infty e^{i\theta}).$$

Thus, in fig. 32, letting

$$\phi'' = \tan^{-1} BB'OB,\ \phi' = \pi/2,$$

we construct $\tilde{\phi}$ as indicated. The red elements $\tilde{A}$ and $\tilde{B}$, the numerators of the tangent ratios, evidently belong to the same

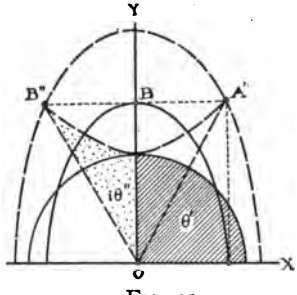

FIG. 32.

elliptic line through the origin and making the angle $\tilde{\phi}$ with the x-axis.

One can write, of course,

$$\tan^{-1} ki = \theta + \tan^{-1} si,$$

but this will give

$$\tan\theta = \frac{(k-s)i}{1-ks}$$

so that θ can be real only when $s = k$ or $1/k$. This requires θ to be an integral multiple of $\pi/2$.

The functions $\cos\tilde{\theta}$ and $\sin\tilde{\theta}$, as well as the argument $\tilde{\theta}$, can be expressed as ratios of areas.[1] We take, in fact, for the denominator of each ratio the triangle (0, 0), (0, 1), (1, 0). The numerator of the cosine ratio is then (0, 0), $\tilde{P}$, (0, 1); of the sine ratio it is the triangle (0, 0) (1, 0), $\tilde{P}$, of $\tilde{\theta}$ it is the complex sector, whose initial line is the x-axis and whose terminal line is (0, 0)$\tilde{P}$.

The ratio of all areas being unaltered by parallel projection, we

[1] Haskell, M. W., Bulletin Math. Soc., I, 155.

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can replace the circle by an ellipse and the perpendicular diameters by conjugate diameters. The rectangular hyperbola is replaced by one whose asymptotes pass through the blue points of the elliptic elements at infinity. The argument $\tilde{\theta}$ is the ratio of a real elliptic sector plus an imaginary hyperbolic sector to the triangle having for side the conjugate semidiameters of the ellipse. The cosine and sine ratios have the same denominator but the numerator of the first is a triangle whose base is the diameter coincident with the initial line of $\tilde{\theta}$ and whose vertex is the elliptic element having its blue point on the terminal line of $\tilde{\theta}$. The numerator of the cosine ratio has the same vertex but the base is the diameter conjugate to that used in the sine ratio, the diameter in fact parallel to the now elliptic element $\tilde{P}$.

A still further generalization can be made if instead of confining ourselves to parallel projection we use projection from a point.[1]

The line at infinity then projects into a line z, while parallels to it project into lines meeting it in a certain fixed point Y. The segments representing the circular points at infinity project into unequal segments; they are such, namely, that their blue points are harmonically conjugate with respect to their common black point and the fixed point Y. The circular rays through any point of the plane project into two imaginary rays through $\tilde{I}\tilde{J}$, the *projected* imaginary points. Lines at right angles are projected into lines harmonically conjugate with respect to $\tilde{I}$ and $\tilde{J}$.

Equal consecutive segments along a line project into segments such that of three consecutive division points the middle one is harmonically separated from z by the other two.

In place of rectangular axes we have axes harmonically conjugate with regard to I'' and J''. In particular, we might take a pair of lines one through Y, call it the y-axis, the other through the common point of $\tilde{I}$ and $\tilde{J}$ call this the x-axis and the point X. The axes so chosen intersect in O; on the x-axis we take, where we please, a point for (1, 0). The coördinates of every point in the plane are then determined. A diagram (fig. 33) makes this

[1] For the analytic theory see Sophus Lie. Vorlesungen über continuerlichen Gruppen, pp. 13 seq.

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plainer than words.[1] The conic (it happens to be an ellipse) through (0, 1), (1, 0), (0—1), (—1, 0), and tangent at these points to lines to (∞, 0) and (0, ∞) has the equation, in the chosen coördinates, $x^2 + y^2 = 1$; is, indeed, the projection of a

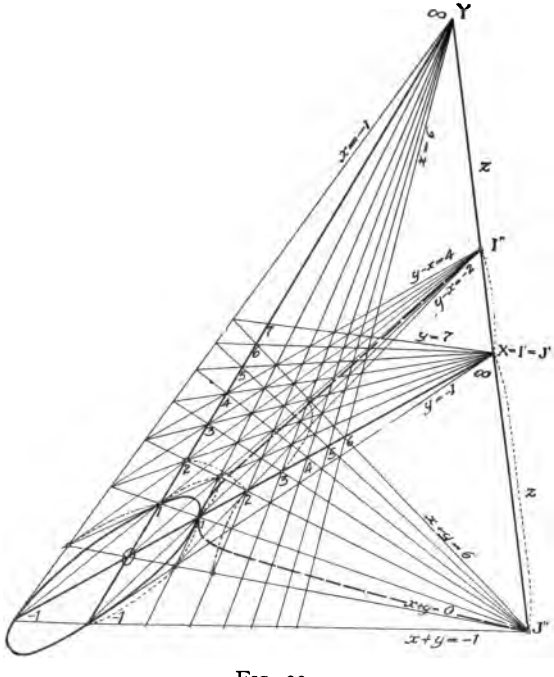

FIG. 33.

circle, while O, the pole of z with respect to the conic, is the projection of that circle's center. Let us call the conic C_2. Various red vectors belonging to the $\tilde{I}$- and $\tilde{J}$-rays through O are indicated. They are projections of elements of the circular rays through the center of the circle. The two blue curves, portions of which are drawn, are supplementary curves of the conic, and projections of supplementary curves of the circle. The perimeter of the conic, defined as $\int \sqrt{dx^2 + dy^2}$, is 2π. The arc

[1] For greater detail see Young, Theory of Point Sets, Chapter 2.

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(0, 1) (1, 0) = arc (1, 0) (−1, 0) = $\pi/2$. Similarly the area of the conic, defined as $\iint dx dy$, is π.

As heretofore an angle θ will have the ratio of a complex sector to the triangle O, (1, 0), (01).

All these statements remain true no matter what sort of diagram may be gotten by point projection of this diagram. The ellipse, in particular, might get projected into a hyperbola, the supplementary curves then becoming ellipses.

The correspondence between the various projections is complete, so that when we are proving a theorem concerning any diagram, we are at one and the same time proving a like theorem concerning every projection of that diagram. For example, in the representation of a complex element by an arrow whose butt is at the center of the $\tilde{J}$-ray and whose barb is at the center of the $\tilde{I}$-ray through the element, it was found, when the element belonged to a circle, that butt and barb were inverse points with respect to that circle. In the projection butt and barb are inverse, in terms of the projected coördinates, with respect to the projection of the circle, be it what conic it may.

In all the above, both the centre of projection and the plane receiving the projection are assumed to be real. Before considering projection from an imaginary center or thrown upon an imaginary plane, it will be necessary to consider imaginary elements in space.

Von Staudt's Representation[1]

In Fig. 33 $\tilde{I}$ and $\tilde{J}$ are the intersections of the line z with the conic C_2. Now, without changing the conic at all, merely revolving the axes, keeping them conjugate, and always regarding z as the projection of a line at ∞ parallel to the Y-axis, we get a different pair of intersections and a different pair of supplementary curves. Thus, what we are to consider as the imaginary intersection of a curve and a line depends upon the choice of axes, depends upon what line through the origin we shall regard as the projection of a parallel to the line at infinity. We can avoid this by saying that the $\tilde{I}$ intersection is the collectivity

[1] Von Staudt, Geometrie der Lage. Lüroth, Math. Ann., Vol. VIII.

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of all the $\tilde{I}$'s, while the $\tilde{J}$ intersection is the collectivity of all the $\tilde{J}$'s. The particular pair $\tilde{I}$ and $\tilde{J}$ used for a symbol of all of them is then what depends upon the choice of axes. The blue points I'', J'' form, in fact, an elliptic involution[1] of points upon the line z. Von Staudt calls this involution of points regarded as having the $\tilde{I}$ direction, one intersection; while regarded as having the $\tilde{J}$ direction he calls it the conjugate intersection. It will be noted that any I' and Y are a pair belonging to the involutions of points on z. Thus the involutions can be called $J''\ I'\ I''\ Y$ and $Y\ I''\ I'\ J''$. Similarly there are the projective involutions of center O determined by and therefore properly denoted by any two pairs of axes. Every real line that bears a red vector. bears an involution of points determined by that red vector. Every two red vectors not borne by the same real line determine an involution of lines whose center is the center of the imaginary line joining the two red vectors and which cuts out on the bearer of each red vector the very involution of which the bearer may be taken as a symbol.[2] I say taken as the symbol, for a vector $\tilde{P}$ has a definite conjugate vector $\bar{P}$ and its bearer meets z in a definite point K, so that if P''' is the blue point of $\bar{P}$ the involution is $P'''P'P''K$. Similarly $P''P'P'''K$ is symbolized by $\bar{P}$.

Again $O\tilde{P}$ is the line of center O of which $\tilde{P}$ is an element, while $O\bar{P}$ is the conjugate line. Suppose that Q is the real point of the $\tilde{I}$-ray through $\tilde{P}$, while R is the real point of the $\tilde{J}$-ray. Then $Q\,\tilde{J}P'''IP''$ is a harmonic set as is also $R\,\tilde{J}P'''IP''$. If on the bearer of $\tilde{P}$ we associate all the pairs of points S''', S'' such that $Q\,\tilde{J}S'''\tilde{I}S''$ is a harmonic set we merely reproduce the involution $\tilde{P}$. In particular, if axes become rectangular and z actually goes to infinity, $S'''Q''$ is a right angle whose revolving arms sweep out the involutions $J'''XI''Y$ on z, $P'''P'P''\ \infty$ on

[1] Reye, Geometrie der Lage.

[2] If the involution be taken on the x-axis, say, with the origin as center and foci at $x = \pm i$, then any real point pair belonging to the involution is $x = \pm \operatorname{ch}\theta'' + i \operatorname{sh}\theta''$. An imaginary point pair is gotten by multiplying the coördinates of a real pair, the one by $\cos\theta' + i \sin\theta'$, the other by $\cos\theta' - i\sin\theta'$. This is the same as to say that any point pair is given by $x = \pm \cos\tilde{\theta} + i\sin\tilde{\theta}$.

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the bearer of $\tilde{P}$, and whose arms constitute the involution of lines through Q. At the same time $J''OI''$ becomes a right angle whose revolution gives the circular involution or ray of center O and cuts out the involution or element $J'''XI''\ Y$ on z.

Just as a red vector is the symbol of an involution on a line, so the red vector of $\tilde{\theta}$ is the symbol of an involution about the vertex of $\tilde{\theta}$ for center, the involution, viz., whose rays make the angles $-\theta''$, 0, θ'', $\pi/2$ with the terminal line of θ'. In rectangular coördinates these would be the two arms of an angle and the two bisectors of the angle. A glance at fig. 31 shows that this involution cuts out on the perpendicular to the terminal line of θ'

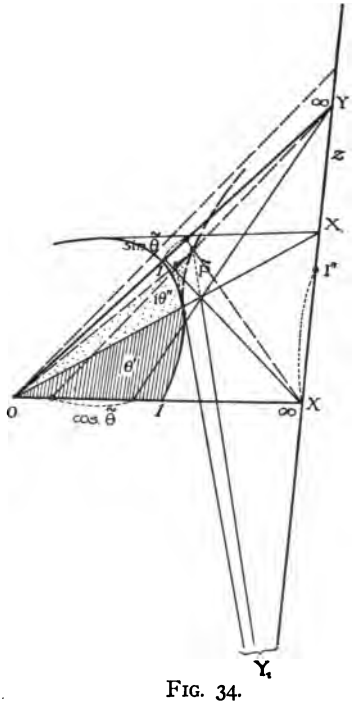

FIG. 34.

through the tip P'' of θ'' the involution $-P''$, 0, P'', ∞ or $-\text{sh}\ \theta''$, 0, $\text{sh}\ \theta''$, ∞ whose symbol is $\tilde{P}$ or $\sin\ \theta''$. Sin $\tilde{\theta}$ is the projection on the y-axis and cos $\tilde{\theta}$ the projection on the x-axis of that

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involution. Similarly tan θ'' is the symbol of the involution $-\tan\theta''$, 0, $\tan\theta''$, ∞ cut out on the perpendicular to the terminal line of θ' through its tip P'.

These statements can all be modified to fit the generalized projected coördinates. In place of perpendicular lines we have lines harmonic with regard to the circular rays through their intersection, say *quasi*-perpendicular.[1] In place of parallel lines we have lines meeting on z, say *quasi*-parallel. Instead of equal line-segments, vectors and angles we have line-segments, vectors and angles whose dimensions, as expressed in the projected coördinates, come out equal. Thus fig. 31 goes over into something like fig. 34, where OX_1 is the terminal line of θ' and OY_1 is quasi-perpendicular thereto. In fact, all lines meeting in Y_1 are *quasi*-perpendicular to each line through X_1, just as all meeting in Y are quasi-perpendicular to each through X.

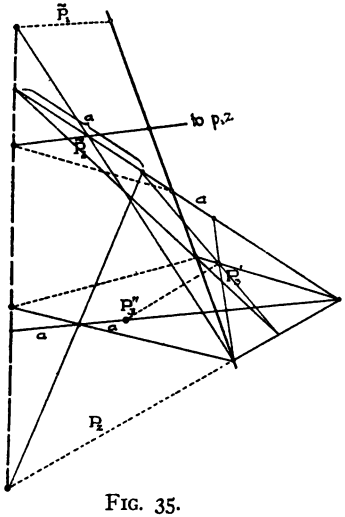

FIG. 35.

Others of our figures can be similarly projected. In particular, it will be interesting to consider the various constructions for a third element given two elements of a line, figs. 9, 10, 11, 12 and 13.

[1] Salmon, Higher Plane Curves.

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We saw in fig. 9 that the row of blue points was projective to the row of corresponding black points, in fact, that they were similar, the infinite points corresponding. When we chose our coördinates, however, so that they become infinite on a line z then it is the intersections of blue line and black line with z that correspond. Call these P_∞'', P_∞'. Then $\tilde{P}_1$, $\tilde{P}_2$, $\tilde{P}_\infty$ completely establish the correspondence of the two rows, giving, as they do, three pairs of coördinated points. It is therefore, possible, given two elements $\tilde{P}_1$, $\tilde{P}_2$ of a line and given on P_1P_2 the part P_3' of a

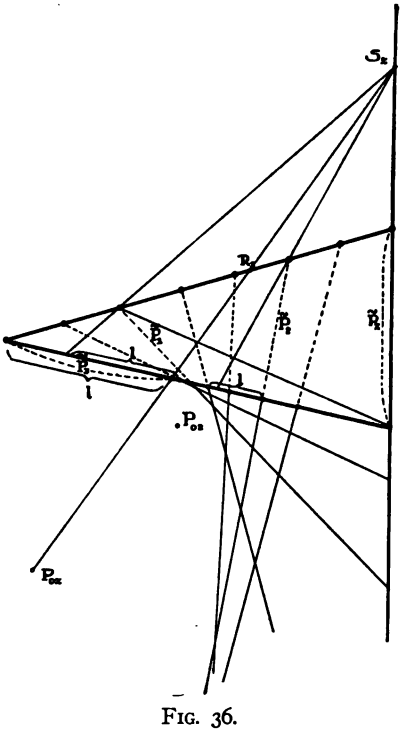

FIG. 36.

third element to choose the other part P_3'' anywhere whatever on $P_1''P_2''$. After that all is fixed. For example, given $\tilde{P}_1$, $\tilde{P}_2$ and with P_3' not on $P_1'P_2'$ fig. 35 shows how to find P_3''. It replaces fig. 11. If P_∞ is changed while $\tilde{P}_1$, $\tilde{P}_2$ and P_3' are fixed P_3'' in

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general moves. If it does not move P_∞' and P_∞'' are describing the two projective rows determined by $\tilde{P}_1\tilde{P}_2$ and the original $\tilde{P}_\infty$.

Given $\tilde{P}_1$, $\tilde{P}_2$ and $\tilde{P}_z$ to find the center of the line joining them we generalize the construction in fig. 12. The result is fig. 36. Here $P_0P_3'R_zS_z$ are harmonic. Note that, in general, the center varies as z changes, even though z remains a bearer of one of the elements joining the lines $P_1'P_2'$ and $P_1''P_2''$. Let us call the center we have obtained P_{0z}, while P_{02} is the center obtained when P_2 interchanges its rôle with P_z. The bearer of P_2 we call p_2. S_2 will lie on p_2 and must therefore be a different point from S_z. Thus P_{02} will be either at a different point than P_{0z} on $P_3'R_z$ or entirely off of that line. The construction gives the point as indicated in figure. P_0 is not entirely arbitrary, however, since it is the pole of some bearer p with respect to each of the infinite family of quasi-similar, quasi-concentric conics from some one of which every red element of the line starts in tangency. The center therefore always lies within the conic enveloped by the bearers $p_1, p_2, p_3, \ldots$ of $\tilde{P}_1, \tilde{P}_2, \tilde{P}_3, \ldots$ connecting the blue line with the black line of the figure. When p_1 is taken for z,

$$K_1 \equiv S_1 \equiv P_{01} \equiv P_1',$$

and the conics to which the red elements are tangent are all line-

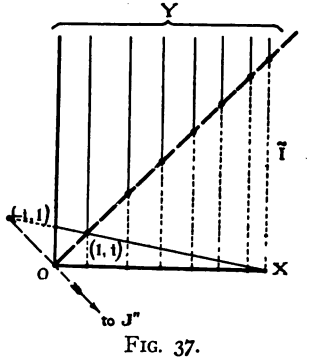

FIG. 37.

pairs, while the imaginary parts of the conjugates of the various red elements vanish. Similarly, when p_4 is taken for z,

$$R_4 \equiv S_4 \equiv P_{04} \equiv P_4'',$$

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and the conics are line-pairs, but the red elements are self-conjugate. If we attempt in either of these cases to construct red vectors other than those joining p_1 and p_4 we meet failure. The cases are rather too exceptional, however, to possess interest.

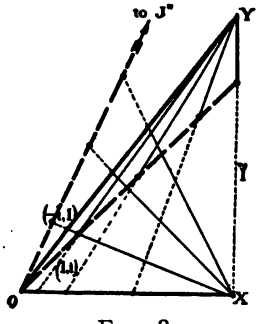

FIG. 38.

Figs. 37 · · · 40 show constructions for new vectors given the center of the line and a vector. Each line is an I-ray whose center is the origin and the given vector is $\tilde{I}$. The vectors drawn

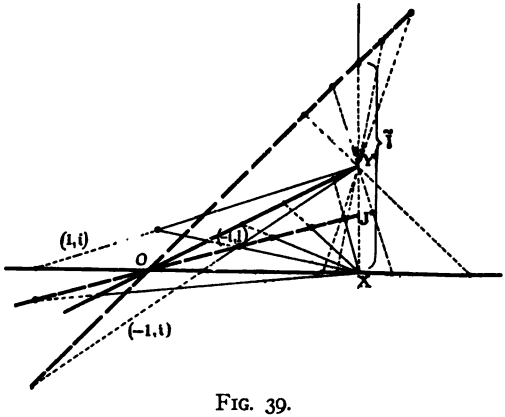

FIG. 39.

have one coördinate wholly real, the other wholly imaginary. Observe that in fig. 37 the vectors with $x''=0$ are apparently as they would be in ordinary rectangular coördinates; but all the other vectors, for example, those for which $y''=0$, are very

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different, the change is even more marked in 38, 39 and 40. Observe also that not only the red vectors but the involution representing the line is changed, since it is $O - XI''YJ''$.

Bearing in mind the possibility of such generalizations let us

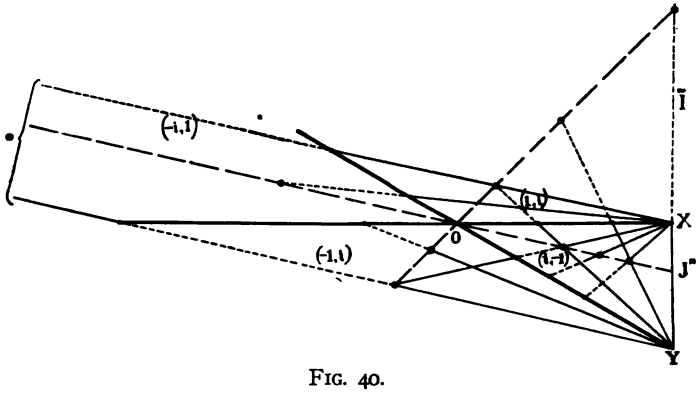

FIG. 40.

turn to the representation of conics and, for convenience, let us use ordinary rectangular coördinates.

THE CONIC

Any conic which by a real shift and turn of axis can be brought to the form

$$\frac{\tilde{x}^2}{a^2}+\frac{\tilde{y}^2}{b^2}=\tilde{k}^2$$

where a and b are real we call an ellipse. The axes of the ellipse are

$$a\tilde{k}=\tilde{c} \quad \text{and} \quad b\tilde{k}=\tilde{d}$$

where $\tilde{c}$ and $\tilde{d}$ are similar, *i. e.*,

$$\begin{vmatrix} c' & d' \\ c'' & d'' \end{vmatrix}=0.$$

The supplementary curves when k^2 is real (for convenience let $k=1$) are hyperbolas whose pairs of asymptotes are pairs of conjugate diameters of the ellipse. These asymptotes form invo-

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lutions and precisely the same involutions as are formed by the blue lines through the origin of the pair of conjugate imaginary lines $x^2/a^2 + y^2/b^2 = 0$. The asymptotes are tangent to the hyperbolas at infinity and cut out on the line infinity involutions which, in Von Staudt's sense, are the intersection of the aforesaid line-pair with the line infinity. We can use as the symbol of these two involutions the red vectors

$$\frac{b}{a}\tilde{I},\ \frac{b}{a}\tilde{J}$$

on the line infinity conceived as parallel to the y-axis.

The circular rays through the foci

$$(x - ae)^2 + y^2 = 0$$

and

$$(x + ae)^2 + y^2 = 0$$

are tangent to the ellipse, as can easily be verified in the usual

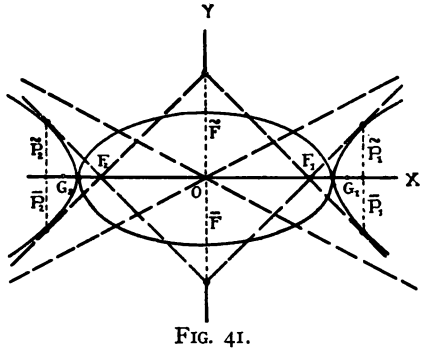

FIG. 41.

way. The thing can be pictured as fig. 41. The blue lines from the four foci $F_1F_2\tilde{F}\bar{F}$ to I'' and J'' are tangent at $\tilde{P}_1$, $\bar{P}_1$, $\tilde{P}_2$, $\bar{P}_2$ to

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1,$$

a supplementary curve. G_1 and G_2 are foci of the hyperbola.

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The modification for the imaginary ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = -1$$

is but slight. Fig. 42 shows it. Note that the real foci are outside while the imaginary foci are inside of the blue ellipse.

Fig. 43 shows the four foci G_1, G_2, $\tilde{G}$, $\bar{G}$ of

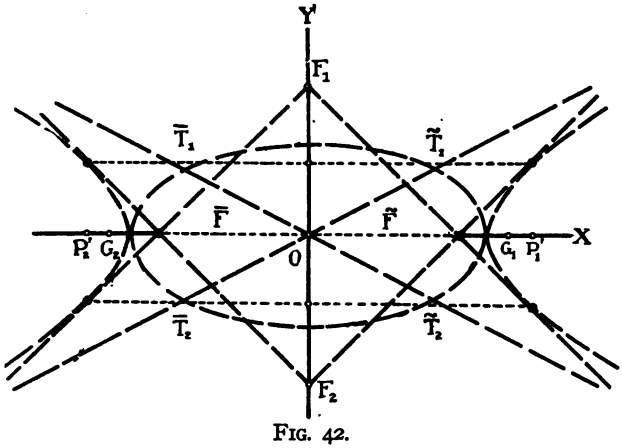

FIG. 42.

$$x^2 - y^2 = 1.$$

The figure also shows two supplementary curves; the circle

$$x^2 + y^2 = 1,$$

and the ellipse

$$(my + x)^2 + (y - mx)^2 = m^2 - 1.$$

Just as in the first, multiplying y by i changes the equation to that of the hyperbola, so in the second, multiplying $(my + x)$ by i produces the same effect. Obviously the blue hyperbola is the envelope of the totality of blue ellipses.

If the figure, exclusive of the coördinate axes, be turned through a right angle it becomes the figure for

$$x^2 - y^2 = 1,$$

the conjugate hyperbola.

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By parallel projection we get the hyperbolas

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = \pm 1.$$

Notice, however, that the projections of the foci will not be the foci of the projected curve. These latter are on

$$x^2 + y^2 = a^2 + b^2,$$

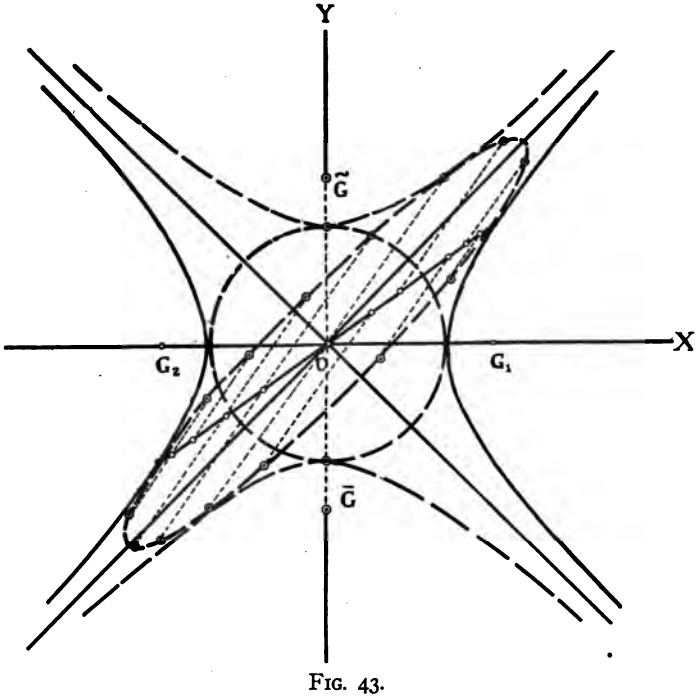

FIG. 43.

or are terminated by that.

Figure 44 shows the ellipse

$$\frac{\tilde{x}^2}{(2+2i)^2} + \frac{\tilde{y}^2}{(1+i)^2} = 1,$$

a special case of

$$\frac{\tilde{x}^2}{a^2} + \frac{\tilde{y}^2}{b^2} = \tilde{k}^2.$$

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The foci are all complex and the representative vectors join the foci of the black ellipse to the corresponding foci of the blue

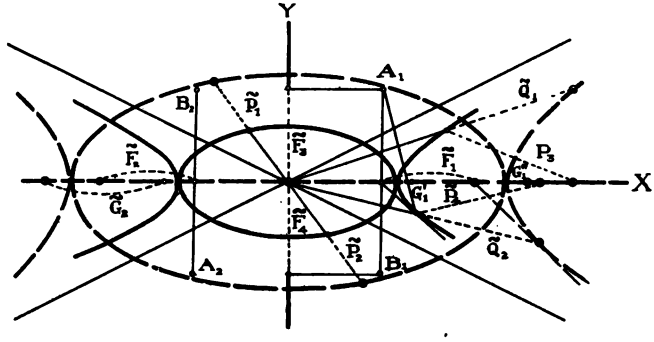

FIG. 44.

ellipse. $\tilde{G}_1$, $\tilde{G}_2$ are foci of a supplementary hyperbola

$$\frac{\tilde{x}^2}{(2+2i)^2} - \frac{\tilde{y}^2}{(1+i)^2} = 1.$$

The companion hyperbola, which is really a part of the ellipse under discussion, is

$$\frac{\tilde{x}^2}{(2+2i)^2} - \tilde{y}^2 = 1,$$

the blue constituent coinciding with the x-axis.

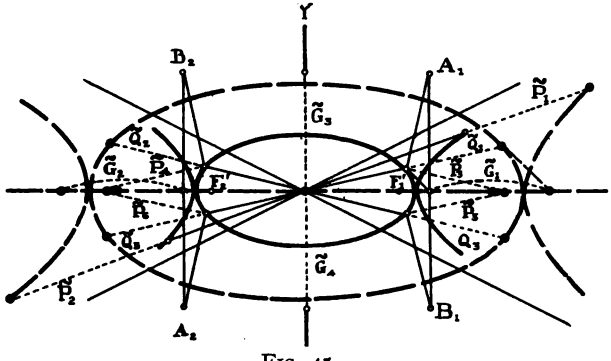

FIG. 45.

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The $\tilde{P}$'s are all elements of the ellipse; the Q's, of the supplementary hyperbola.

In fig. 45 the supplementary curve of fig. 44 is made fundamental. The I-ray through $\tilde{G}_1$ is tangent in $\tilde{P}_8$, the J-ray through B_1 in $\tilde{P}_5$. The Q's are now elements of the supplementary ellipse.

If the fundamental curve is

$$\frac{\tilde{x}^2}{a^2} \pm \frac{\tilde{y}^2}{b^2} = \tilde{k}^2,$$

then it has in the first place for elements red vectors radial[1] from the origin joining points on

$$\frac{x}{a^2} \pm \frac{y^2}{b^2} = k'^2.$$

to

$$\frac{x^2}{a^2} \pm \frac{y^2}{b^2} = (k' + k'')^2.$$

In the second place, it has the elements obtained by multiplying by i the y-coördinates of the radial elements of the supplementary curve

$$\frac{\tilde{x}^2}{a^2} \mp \frac{\tilde{y}^2}{b^2} = 1.$$

These elements belong to the companion curve

$$\frac{\tilde{x}^2}{a^2(k' + ik'')^2} \mp \frac{\tilde{y}^2}{b^2(k'' - ik')} = 1,$$

for which we can take

$$\frac{x^2}{a^2 k'^2} \mp \frac{y^2}{b^2 k''^2} = 1,$$

and

$$\frac{x^2}{a^2(k + k'')^2} \mp \frac{y^2}{b^2(k' - k'')} = 1,$$

as black curve and blue curve respectively. The equation of the companion curve, notice, is the same as that of the fundamental.

[1] That is, on real lines through the origin.

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In the third place, and finally, it contains all the elements gotten by referring the curve to all the possible pairs of conjugate diameters as axes and then taking the totality of non-radial elements of the companion curves.

The more general conic

$$\frac{\tilde{x}^2}{\tilde{a}^2}+\frac{\tilde{y}^2}{\tilde{b}^2}=1$$

where $\tilde{a}$ and $\tilde{b}$ are non-similar complex quantities can be made to depend on that just considered or more simply upon that of the circle of complex radius. For any element is at once a vertical projection of an element of

$$\tilde{x}^2+\tilde{y}^2=\tilde{a}^2$$

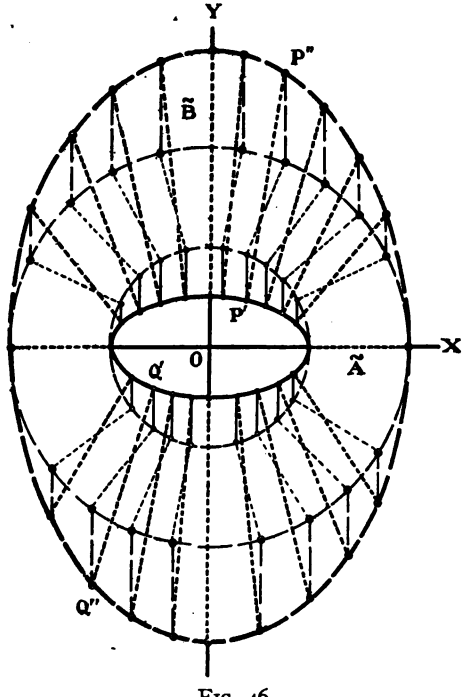

FIG. 46.

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and a horizontal projection of an element of

$$\tilde{x}^2 + \tilde{y}^2 = \tilde{b}^2,$$

the two elements from the auxiliary circles being collinear with the origin so that if $(\tilde{x}_1, \tilde{y}_1)$ is from the first circle while $(\tilde{x}_2, \tilde{y}_2)$ is from the second, then .

$$\frac{\tilde{x}_1}{\tilde{x}_2} = \frac{\tilde{y}_1}{\tilde{y}_1} = \frac{\tilde{a}}{\tilde{b}}.$$

The elements divide into two sets, viz: Those which are determined by radial elements of the circles as shown in fig. 46, $\tilde{A}$, $\tilde{B}$, $\tilde{P}$, $\tilde{Q}$ et al. Those which are determined by non-radial elements of the circles as shown by the $\tilde{P}$'s, other than $\tilde{P}_3$ and $\tilde{P}_8$, in fig. 47.

The determination of $\tilde{P}_6$, $\tilde{P}_8$, $\tilde{P}_9$ by their end points is shown.

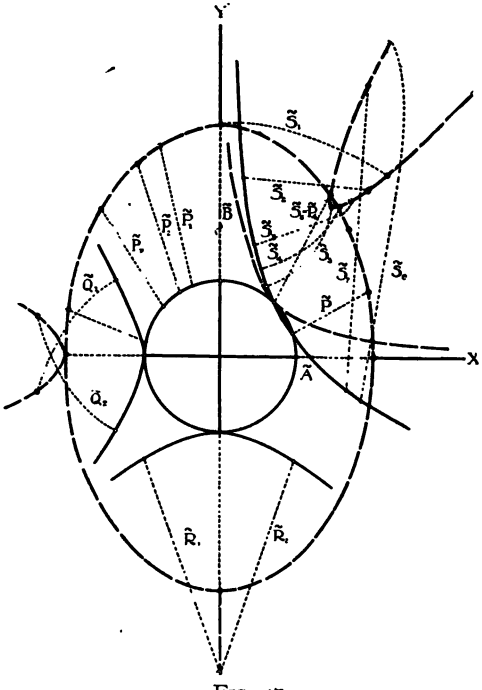

FIG. 47.

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The equation of the companions to the first circle referred to axes OX_1, OY_1, making an angle θ with the x- and y-axes is

$$\frac{\tilde{x}_1^2}{(a'+ia'')^2} - \frac{\tilde{y}_1}{(a''-ia')^2} = 1.$$

Thus the black hyperbola is

$$\frac{x_1^2}{a'^2} - \frac{y_1'^2}{a''^2} = 1,$$

while the blue one is

$$\frac{x_1^2}{(a'+a'')^2} - \frac{y_1^2}{(a''-a')^2} = 1.$$

Changing the a's to b's gives of course the corresponding curves for the other circle.

In the particular case chosen for the diagram, the six curves are

$$\frac{\tilde{x}_1^2}{(1+i)^2} - \frac{\tilde{y}_1^2}{(1-i)^2} = 1, \quad x_1'^2 - y_1'^2 = 1, \quad \eta_1^2 = 0;$$

$$\frac{\tilde{x}_2^2}{(1+2i)^2} - \frac{\tilde{y}_2^2}{(2-i)^2} = 1, \quad x_2'^2 - \frac{y_2'^2}{4} = 1, \quad \frac{\xi_2^2}{9} - \eta_2^2 = 1.$$

There is the further condition that, if (x_{11}, y_{11}) belongs to the first companion while (x_{12}, y_{12}) belongs to the second, then

$$\frac{\tilde{x}_1}{\tilde{x}_2} = \frac{\tilde{y}_1}{\tilde{y}_2} = \frac{1+i}{1+2i} = \frac{3-i}{5}.$$

This method is equivalent analytically to expressing the coördinates by a parameter $\tilde{\theta} = \theta' + i\theta''$. Thus,

$$\tilde{x} = \tilde{a}\cos\tilde{\theta}, \quad \tilde{y} = \tilde{b}\sin\tilde{\theta}.$$

Whence

$$\begin{aligned}
x' &= a'\cos\theta'\operatorname{ch}\theta'' + a''\sin\theta'\operatorname{sh}\theta'',\\
x'' &= -a'\sin\theta'\operatorname{sh}\theta'' + a''\cos\theta'\operatorname{ch}\theta'',\\
\xi &= (a'+a'')\cos\theta'\operatorname{ch}\theta'' + (a''-a')\sin\theta'\operatorname{sh}\theta'',\\
y' &= b'\sin\theta'\operatorname{ch}\theta'' - b''\cos\theta'\operatorname{sh}\theta'',\\
y'' &= b'\cos\theta'\operatorname{sh}\theta'' - b''\sin\theta'\operatorname{ch}\theta'',\\
\eta &= (b'+b'')\sin\theta'\operatorname{ch}\theta'' - (b''-b')\cos\theta'\operatorname{sh}\theta''.
\end{aligned}$$

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If we fix θ', while θ'' is allowed to vary, the black point (x', y') will move on the hyperbola

$$(b''x' \cos\theta' + a''y' \sin\theta')^2 - (b'x' \sin\theta' - a'y' \cos\theta')^2 = (a'b'' \cos^2\theta' + a''b' \sin^2\theta)^2,$$

while the blue point (ξ, η) is at the same time moving on

$$[(b''-b')\xi \cos\theta + (a''-a')\eta \sin\theta']^2 - [(b'+b'')\xi \sin\theta' - (a'+a'')\eta \cos\theta')]^2 = [(a'+a'')(b''-b') \cos^2\theta'^2 + (a''-a')(b'+b'') \sin^2\theta']^2.$$

Rearranging, these become, respectively,

$$(b''^2 \cos^2\theta' - b'^2 \sin^2\theta')x'^2 + 2(a'b' + a''b'') \sin\theta' \cos\theta' x'y' + (a''^2 \sin^2\theta' - a'^2 \cos^2\theta')y'^2 = a'^2b''^2 \cos^2\theta' + 2a'a''b'b'' \cos^2\theta \sin^2\theta + a''^2b'^2 \sin^2\theta',$$

and

$$[(b'^2 + b''^2)(\cos^2\theta' - \sin^2\theta') - 2b'b'']\xi^2 + 4(a'b' + a''b'') \sin\theta' \cos\theta'\xi\eta - [(a'^2 + a''^2)(\cos^2\theta' - \sin^2\theta') + 2a'a'']\eta^2 = [(a'b'' - a''b')(\cos^2\theta' - \sin^2\theta') + a''b'' - a'b']^2.$$

Considerable simplification results, of course, for θ' equal to an integral multiple of $\pi/2$.

If, on the other hand, we fix θ'' while θ' is allowed to vary, the black point will move on the ellipse

$$(b''x' \operatorname{sh}\theta'' + a'y' \operatorname{ch}\theta'')^2 + (b'x' \operatorname{ch}\theta'' - a''y' \operatorname{sh}\theta'') = (a''b'' \operatorname{sh}^2\theta'' + a'b' \operatorname{ch}^2\theta'')^2,$$

while the blue point is moving on

$$[(b''-b')\xi \operatorname{sh}\theta'' + (a'+a'')\eta \operatorname{ch}\theta']^2 + [(b'+b'')\xi \operatorname{ch}\theta'' - (a''-a')\eta \operatorname{sh}\theta'']^2 = [(a''-a')(b''-b') \operatorname{sh}^2\theta'' + (a'+a'')(b'+b'') \operatorname{ch}^2\theta'']^2.$$

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Rearrangement gives, respectively,

$$(b'^2 \operatorname{ch}^2\theta'' + b''^2 \operatorname{sh}^2\theta')x'^2 + 2(a'b'' - a''b')\operatorname{ch}\theta' \operatorname{sh}\theta'' x'y' + (a'^2 \operatorname{ch}^2\theta'' + a''^2 \operatorname{sh}^2\theta')y'^2 = a'^2b'^2 \operatorname{ch}^2\theta' + 2a'b'a''b'' \operatorname{ch}^2\theta' \operatorname{sh}^2\theta'' + a'^2b'^2 \operatorname{sh}^4\theta'',$$

and

$$[(b'^2 + b''^2)(\operatorname{ch}^2\theta'' + \operatorname{sh}^2\theta')]\xi^2 + 2b'b'' + 4(a'b'' - a''b')\operatorname{ch}\theta' \operatorname{sh}\theta'\xi\eta + [(a'^2 + a''^2)(\operatorname{ch}^2\theta' + \operatorname{sh}^2\theta')]\eta^2 + 2a'a'' = [(a'b' + a''b'')^2(\operatorname{ch}^2\theta'' + \operatorname{sh}^2\theta'') + a'b'' + a''b']^2.$$

Every element belonging to the locus is the intersection of a curve pair $\theta' =$ constant with a curve pair $\theta'' =$ constant. Thus,

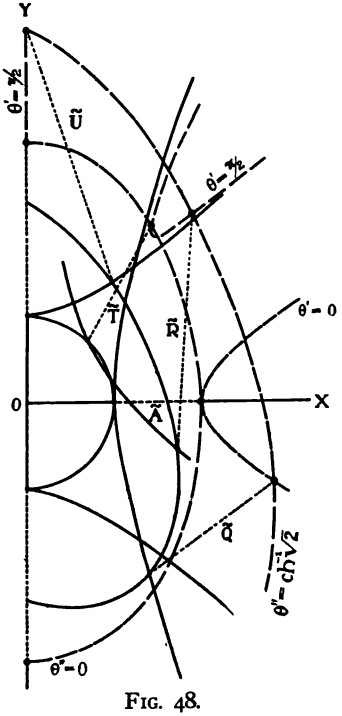

FIG. 48.

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in fig. 48, $\tilde{A}, \tilde{B}, \tilde{Q}, \tilde{R}, \tilde{T}, \tilde{U}$, are seen each to belong to two curve pairs.

The intersection with the line infinity is composed of the intersections of the asymptote pairs which again are the two involutions cut out by

$$\frac{\tilde{x}^2}{\tilde{a}^2} + \frac{\tilde{y}^2}{\tilde{b}^2} = 0.$$

Notice that for the asymptotes of a black hyperbola to coincide with the asymptotes of a corresponding blue hyperbola would require that the coefficients of the left members were proportional and so

$$a'^2 - a''^2 + 2a'a'' = b'^2 - b''^2 + 2b'b'' = 0,$$

which is independent of θ. Thus, if there is a single case of coincidence, for a given locus, there is always coincidence.

Not every pair of concentric ellipses can belong to such a system as that determined by

$$\frac{\tilde{x}^2}{\tilde{a}^2} + \frac{\tilde{y}^2}{\tilde{b}^2} = 1.$$

For in order that the pair

$$A_1x'^2 + 2Hx'y' + B_1y'^2 = C_1^2, \quad A_2\xi^2 + 4H\xi\eta + B_2\eta^2 = C_2^2,$$

should belong to the system, it is necessary that simultaneously we can have

$$A_1B_1 - H^2 = C_1^2 \quad \text{and} \quad A_2B_2 - 4H^2 = C_2^2.$$

This imposes one condition upon the ellipses. That condition satisfied, we have five equations in the five unknowns a', a'', b', b'', θ'', the equations, namely,

$$\begin{aligned}
b'^2 \operatorname{ch}^2\theta'' + b''^2 \operatorname{sh}^2\theta'' &= A_1, \\
a'^2 \operatorname{ch}^2\theta'' + a''^2 \operatorname{sh}^2\theta'' &= B_1, \\
(a'b'' - a''b') \operatorname{ch}\theta'' \operatorname{sh}\theta' &= H, \\
(b'^2 + b''^2)(\operatorname{ch}^2\theta'' + \operatorname{sh}^2\theta') + 2b'b'' &= A_2, \\
(a'^2 + a''^2)(\operatorname{ch}^2\theta'' + \operatorname{sh}^2\theta') + 2a'a'' &= B_2.
\end{aligned}$$

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There is somewhat greater complication introduced if we suppose the conic

$$\frac{\tilde{x}^2}{\tilde{a}^2}+\frac{\tilde{y}^2}{\tilde{b}^2}=1$$

to be turned through the imaginary angle $i\phi$.

We then write

$$\tilde{x}\cos i\phi+\tilde{y}\sin i\phi=\tilde{x}\operatorname{ch}\phi+i\tilde{y}\operatorname{sh}\phi=\tilde{a}\cos\tilde{\theta}$$

and

$$-\tilde{x}\sin i\phi+\tilde{y}\cos i\phi=-i\tilde{x}\operatorname{sh}\phi+\tilde{y}\operatorname{ch}\phi=\tilde{b}\sin\tilde{\theta},$$

the equation of the conic becoming

$$\tilde{x}^2\left(\frac{\operatorname{ch}^2\phi}{\tilde{a}^2}-\frac{\operatorname{sh}^2\phi}{\tilde{b}^2}\right)+2i\tilde{x}\tilde{y}\operatorname{sh}\phi\operatorname{ch}\phi\left(\frac{1}{\tilde{a}^2}-\frac{1}{\tilde{b}^2}\right)+\tilde{y}^2\left(\frac{-\operatorname{sh}^2\phi}{\tilde{a}^2}+\frac{\operatorname{ch}^2\phi}{\tilde{b}^2}\right)=1.$$

When now θ'' is fixed we find, on elimination of θ', that (x',y') moves on

$$\begin{aligned}
&x'^2\{(b'^2\operatorname{ch}^2\theta'+b''^2\operatorname{sh}^2\theta'')\operatorname{ch}^2\phi+2(a'b'+a''b'')\operatorname{ch}\theta''\operatorname{sh}\theta''\operatorname{ch}\phi\operatorname{sh}\phi\\
&\quad+(a'^2\operatorname{sh}^2\theta''+a''^2\operatorname{ch}^2\theta'')\operatorname{sh}^2\phi\}\\
&\quad+2x'y'\{(a'b''-a''b'')\operatorname{ch}\theta'\operatorname{sh}\theta''+(a'a''+b'b'')\operatorname{ch}\phi\operatorname{sh}\phi\}\\
&\quad+y'^2\{(a'^2\operatorname{ch}^2\theta''+a''^2\operatorname{sh}^2\theta')\operatorname{ch}^2\phi\\
&\quad+2(a'b'+a''b'')\operatorname{ch}\theta'\operatorname{sh}\theta''\operatorname{ch}\phi\operatorname{sh}\phi\\
&\quad+(b'^2\operatorname{sh}^2\theta''+b''^2\operatorname{ch}^2\theta')\operatorname{sh}^2\phi\}\\
&\quad=\{(a'b'\operatorname{ch}^2\theta''+a''b''\operatorname{sh}^2\theta'')\operatorname{ch}^2\phi\\
&\quad+(a'^2+b'^2+a''^2+b''^2)\operatorname{ch}\theta'\operatorname{sh}\theta'\operatorname{ch}\phi\operatorname{sh}\phi\\
&\qquad+(a'b'\operatorname{sh}^2\theta'+a''b''\operatorname{ch}^2\theta'')\operatorname{sh}^2\phi\}^2.
\end{aligned}$$

The point (ξ,η) is at the same time moving on

$$\begin{aligned}
&\{(a'a''+b'b'')(\operatorname{ch}^2\theta'+\operatorname{sh}^2\theta')(\operatorname{ch}^2\phi+\operatorname{sh}^2\phi)+a'b''+a''b'\\
&\quad+2(a'^2+b'^2+a''^2+b''^2)\operatorname{ch}\theta'\operatorname{sh}\theta'\operatorname{ch}\phi''\operatorname{sh}\phi'')\}^2\\
&\quad=\xi^2\{[(b'^2+b''^2)(\operatorname{ch}^2\theta''+\operatorname{sh}^2\theta')+2b'b'']\operatorname{ch}^2\phi\\
&\quad+4(a'b'+a''b'')\operatorname{ch}\theta''\operatorname{sh}\theta'\operatorname{ch}\phi\operatorname{sh}\phi
\end{aligned}$$

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$$+ [(a'^2 + a''^2)(\mathrm{ch}^2\theta'' + \mathrm{sh}^2\theta'') - 2a'a''] \mathrm{sh}^2\phi\}$$
$$+ 2\xi\eta\{2(a'b'' - a''b') \mathrm{ch}\,\theta'' \mathrm{sh}\,\theta''$$
$$+ (a''^2 - a'^2 - b''^2 + b'^2) \mathrm{ch}\,\phi \mathrm{sh}\,\phi\}$$
$$+ \eta^2\{[(a'^2 + a''^2)(\mathrm{ch}^2\theta'' + \mathrm{sh}^2\theta'') + 2a'a''] \mathrm{ch}^2\phi$$
$$+ 4(a'b' + a''b'') \mathrm{ch}\,\theta'' \mathrm{sh}\,\theta'' \mathrm{ch}\,\phi \mathrm{sh}\,\phi$$
$$+ [(b'^2 + b''^2)(\mathrm{ch}^2\theta'' + \mathrm{sh}^2\theta'') - 2b'b''] \mathrm{sh}^2\theta]\}.$$

In these more general equations the coefficient of $\xi\eta$ is no longer a mere multiple of that of xy, and the condition that the square of the discriminant of the left member should equal the opposite of the constant term can be satisfied independently for the two ellipses. The six unknowns a', b', a'', b'', θ'', ϕ are then connected by six independent[1] equations. Thus any two ellipses with center at origin and which will give real values for these unknowns can belong to the system.

In this most general case, as in the simpler ones formerly considered, we can have the black ellipse and the blue ellipse simultaneously described by motions which are composed of two simple harmonic motions; the motions, in fact for θ' varying uniformly with the time, are given by

$$x' = \cos\theta' (a' \mathrm{ch}\,\theta'' \mathrm{ch}\,\phi + b' \mathrm{sh}\,\theta'' \mathrm{sh}\,\phi) + \sin\theta' (a'' \mathrm{sh}\,\theta'' \mathrm{ch}\,\phi + b'' \mathrm{ch}\,\theta'' \mathrm{sh}\,\phi),$$

$$y' = \cos\theta' (-b'' \mathrm{sh}\,\theta'' \mathrm{ch}\,\phi - a'' \mathrm{ch}\,\theta'' \mathrm{sh}\,\phi) + \sin\theta' (b' \mathrm{ch}\,\theta'' \mathrm{ch}\,\phi + a' \mathrm{sh}\,\theta'' \mathrm{sh}\,\phi),$$

and

$$\xi = \cos\theta' (a' + a'') \mathrm{ch}\,\theta'' \mathrm{ch}\,\phi + (b' + b'') \mathrm{sh}\,\theta'' \mathrm{sh}\,\phi) + \sin\theta' [(a'' - a') \mathrm{sh}\,\theta'' \mathrm{ch}\,\phi + (b'' - b') \mathrm{ch}\,\theta'' \mathrm{sh}\,\phi),$$

$$\eta = \cos\theta' [(b' - b'') \mathrm{sh}\,\theta'' \mathrm{ch}\,\phi + (a' - a'') \mathrm{ch}\,\theta'' \mathrm{sh}\,\phi) + \sin\theta' [(b' + b'') \mathrm{ch}\,\theta'' \mathrm{ch}\,\phi + (a' + a'') \mathrm{sh}\,\theta'' \mathrm{sh}\,\phi).$$

The elimination of θ' from these equations gives the foregoing equations of the black ellipse and the corresponding blue ellipse. If from the same equations we eliminate θ'' we get a pair of hyperbolas.

[1] The Jacobian does not vanish, as can be seen by substituting therein special values for the unknown.

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The black one is

$$\begin{vmatrix} x', b' \cos\theta' \operatorname{sh}\phi + a'' \sin\theta' \operatorname{ch}\phi \\ y', -b'' \cos\theta' \operatorname{ch}\phi + a' \sin\theta' \operatorname{sh}\phi \end{vmatrix}^2$$

$$- \begin{vmatrix} a' \cos\theta' \operatorname{ch}\phi + b'' \sin\theta' \operatorname{sh}\phi, x' \\ -a'' \cos\theta' \operatorname{sh}\phi + b' \sin\theta' \operatorname{ch}\phi, y' \end{vmatrix}^2$$

$$= \begin{vmatrix} a' \cos\theta' \operatorname{ch}\phi + b'' \sin\theta' \operatorname{sh}\phi, & b' \cos\theta' \operatorname{sh}\phi + a'' \sin\theta' \operatorname{sh}\phi \\ -a'' \cos\theta' \operatorname{sh}\phi + b' \sin\theta' \operatorname{ch}\phi, & -b'' \cos\theta' \operatorname{ch}\phi + a' \sin\theta' \operatorname{sh}\phi \end{vmatrix}^2$$

or, say,

$$(Dx' - Cy')^2 - (-Bx' + Ay')^2 = (AD - BC)^2.$$

The blue one can be similarly written down from the equations for ξ and η. Or what is the same thing, in the A, B, C, D for a', a'', b', b'' substitute respectively, $a' + a''$, $a'' - a'$, $b' + b''$, $b'' - b'$ and for (x', y'), (ξ, η).

Somewhat less interesting are the non-central conics unless we except those in which the terms of the second degree are the square of a circular ray. For then, just as the square equated to a constant represents two lines making any angle you please with each other; so, when the same square is equated to a linear expression the resulting locus may be regarded either as a parabola or as an ellipse whose imaginary asymptotes make any real angle you please with each other.

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The Erysiphaceae of Nebraska

BY RAYMOND J. POOL

INTRODUCTION

The Erysiphaceae are parasitic fungi which are popularly known as "Powdery Mildews," "Blights," or "Leaf Mildews." They are easily recognized by the white or colorless, more or less dusty or felt-like covering on leaves, stems, or other infected parts. They are common on many of our common garden and field plants, as well as on many pieces of "wild" or non-cultivated plants. The dusty appearance is due mostly to the presence of myriads of colorless or white conidiospores which are characteristic of the "Oidium" or conidial stage in the development of any given species. Later in the summer, or autumn, the ascigerous form of fruit is developed which is in the shape of small, more or less globular, dark brown or black perithecia. The perithecia are usually provided with special outgrowths, the appendages. After the perithecia are formed the mycelium sometimes disappears, and the black perithecia are left on the surface of the leaves or stems of the host; sometimes the mycelium is thick and persistent on the host and then the perithecia are more or less immersed in the patches of cobwebby mycelium.

The Erysiphaceae belong to the Ascomycetes, and they are further classified under various orders by different writers. Thus we find that they are given the rank of a family or a sub-family under the Order Perisporiales, Pyrenomycetales, or Sphaeriales. Fortunately plants are not changed by simply changing their name or the name of the group, or by transferring them from one group to another. The Order Sphaeriales is perhaps the best name for the order which includes the plants in question.

The Erysiphaceae are characterized by the truly parasitic type of nutrition, the production of large, hyaline, non-septate conidia

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in great abundance on simple, erect sporophores, the small globose indehiscent perithecia (cleistocarps) provided with appendages of definite form, containing asci with large, non-septate spores.

Structure and Round of Life

The mycelium consists of many delicate, silky, white or colorless or sometimes brownish filaments or hyphae with many cross partitions at rather long intervals. The hyphae are often branched and interwoven so that a more or less densely tangled and felt-like mycelium is produced in many species. In all the genera except *Phyllactinia,* hyphae of the vegetative mycelium produce off-shoots at intervals which pierce the outer walls of the host cells and swell into bladder-like structures (Plate II, figs. 16–17), haustoria, in the epidermal cells. The function of these haustoria is double, to attach the fungus to the host and to serve as absorbing organs which draw nutrient material from the epidermal cells and pass it out to the external mycelium upon which the conidia and perithecia are formed. However, in the genus *Phyllactinia* we have an interesting and important difference in the matter of the formation of the haustoria. In this genus haustoria are not sent into the epidermal cells of the host, but instead special hyphal branches, of limited growth, are developed which enter the host tissue by way of the stomata. Once inside, these branches wind about in the inter-cellular air spaces and finally send haustoria into the surrounding cells. These special hyphae consist usually of more than one cell (up to three or rarely more), but in all cases the haustorium is produced by the last cell of the filament. The haustorium itself is similar to the haustoria of the other genera of the Erysiphaceae. With the exception of these special branches and of the haustoria, the mycelium of all our species in the group is external to the tissues of the host.—However Salmon in his studies on the group has pointed out that in *Erysiphe taurica* the mycelium which produces the conidiospores is endophytic, and the conidiophores emerge singly or in groups through the stomata. The conidiophores are also sometimes branched, another char-

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acter which does not exist elsewhere in the family. In the later stages of the conidia production mycelial hyphae emerge in great numbers from the stomata, and form an external mycelium on the surface of the leaf very similar to the mycelium of the other species of the group. Upon this mycelium the perithecia are developed. On account of these peculiarities, Salmon considers that *Erysiphe taurica* differs generically from the other members of the group, and he has given the name *Oidiopsis* to this particular form. He also proposed a new sub-family, Oidiopsidae, for the reception of this genus.

There are two kinds of reproductive bodies formed in the Erysiphaceae, the asexually-produced conidia or conidiospores, and the ascopores formed in perithecia. The conidia are formed under the favorable conditions prevailing throughout the summer and early autumn. From the mycelium arise erect, simple hyaline or white branches which are very delicate, thin-walled, one- to many-septate, and about 10μ thick and from 120–380μ high. The conidia are formed at the tips of these branches (Plate I, fig. 2) either singly or in long chains in basipetal succession. The conidia are continuous, colorless or white, oblong, cylindrical or barrel-shaped, smooth, thin-walled and 18–50 $\times$ 9–25μ in size.

The conidia are formed in immense numbers throughout the summer. They are easily carried by the wind, and are capable of immediate germination (Plate I, fig. 3) on reaching a suitable host. The conidia are therefore excellent devices for the rapid spread of the fungus during the growing season.

These conidial forms were formerly classified as separate species of the genus *Oidium,* a supposed autonomous genus of the hyphomycetes. By the researches of Berkeley and Tulasne from 1840–1855 it was proved that an organic connection exists between the mycelium which produces the conidia and that which later in the season bears the ascigerous fruits.

The second kind of reproductive body of the Erysiphaceae is formed and matured much later in the autumn, at a time when the general tone of the host plant is on the decline. The conidia

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give way to the perithecia containing ascospores (Plate I, figs. 11–12) which are more resistent to the unfavorable conditions which obtain at the final death of the host or with the approach of leaf fall and the assumption of the resting state by the host.

De Bary first worked out the history of the development of the perithecium. At the point of contact of two hyphae a lateral branch is formed on each hypha, each of which is soon cut off from its mother hypha by a septum (Plate I, fig. 4); or the two branches are formed by the tips of two adjacent hyphae which come in contact and from the tip of each the septum cuts off a cell. One of these branches or lateral cells gradually enlarges until it is oval-oblong in shape, and becomes the oögone (Plate I, fig. 5). The other branch lengthens and becomes closely fixed to the wall of the oögone (Plate I, fig. 5) curving over so that its apex lies on the tip of the oögone. A cell is then cut off from the upper extremity of the smaller branch (Plate I, fig. 6) which becomes this antherid.

The common wall between oögone and antherid soon becomes dissolved and the nucleus of the antherid passes into the oögone and there fuses with the nucleus of that cell (Plate I, fig. 7). This conjugation marks the beginning of the development of the perithecium. In fact at about this time the development of the walls of the future perithecium begins. From the stalk cell of the fertilized oögone (the carpogone) branches grow upward and closely inclose the carpogone with a single layer of cells (Plate I, fig. 8). After the stalk cell has enlarged somewhat a second layer of cells (Plate I, fig. 9) interior to the first layer is added to the covering of the carpogone. By copious branching and intertwining the hyphae of both series become grown together forming a well-defined pseudoparenchymatous tissue of several layers in thickness about the young perithecium. The outer layers of cells become flattened (Plate I, fig. 11), lose their protoplasmic contents, become brown or nearly black in some cases and constitute the outer wall of the perithecium. The cells of the inner layer remain soft and eventually most of them disappear during the formation of the ascus or the asci.

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While the two primary wall layers are being formed, a row of from three to six cells (Plate I, fig. 10) is formed by the elongation and the division of the carpogone. In the penultimate cell of this row there are two nuclei which soon fuse. Then this cell, which is to become the ascus, rapidly increases in size (Plate I, fig. 10), absorbs the apical cell and many of the surrounding cells, its fusion nucleus divides to form the spores (Plate I, fig. 11), and finally the ascus with its contained spores becomes mature. In the poly-ascus genera the sequence in this process is essentially as has been given above. The only marked variation is of course seen in the formation of more than one ascus upon the division of the carpogone, a detail which need not be considered in this place.

The asci are colorless sacks. They are sessile or often somewhat pedicellate, globose, ovate, or cylindrical in shape (Plate I, fig. 12) and from one to sixty or more in number. They contain from two to eight spores which are also colorless. The spores are continuous, with granular contents, oval or oblong, and 15–34 × 8–25μ in size. Sometimes the ascospores do not ripen until the spring following their first appearance upon the host. They are incapable of immediate germination, apparently demanding a resting stage of several months duration before they will germinate. The germination of the ascospores (Plate I, fig. 1) and the development of the mycelium from them is very similar to that process in the case of the conidia. Because of the rather low percentage of germination of the ascospores they are not nearly so effective in the rapid spread of the fungus as are the conidia. The appendages on the perithecium are merely extensions of certain cells in the outer wall (Plate I, fig. 11) of the perithecium. Sometimes the perithecia when crushed emit instead of the usual contents, a stream of small oblong spores 6.5–10 × 3.5–6μ in size, immersed in a colorless granular material. In such cases there may usually be found on the same mycelium smaller perithecia-like bodies which are oval or pyriform in shape and which contain the same kind of spores. These are the fruits and spores of an imperfect fungus, *Ampelomyces*

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quisqualis Caseti., which is parasitic upon the mildew. Sometimes the perithecia are filled with the fruits of the parasite to the exclusion of the asci. This parasite apparently attacks all of the species in the group, and when abundant probably serves in a measure to check the development of the particular mildew infected. It is possible that the vitality of the mildew is so lessened by such an attack that its spread is considerably checked.

The Erysiphaceae are of considerable economic importance as plant diseases. In some localities they become quite destructive. The pathological phase of the group is left for the plant pathologist. Suggestions along this line with directions for their prevention or control may be found in many Agricultural Experiment Station publications, and in more extensive treatises on plant pathology in general.

ERYSIPHACEAE Lev.

Fungi parasitic on seed plants; epiphytic or partially endophytic; mycelium white, or in some cases becoming brownish; haustoria formed in the epidermal cells from external hyphae, or within deeper lying cells from special hyphal branches sent through the stomata into the intercellular air spaces; hyphae thin-walled, septate, much branched and interwoven; conidia large, continuous, hyaline, cylindrical, oblong, or barrel-shaped, produced singly or in chains on erect, simple, septate, colorless sporophores; perithecia on the mycelium, at first colorless, then yellow to brown, finally black, membranous or carbonous, without an ostiole, globose or globose-depressed, sometimes becoming lenticular or concave; asci one to many, arising from the base of the perithecium, colorless, cylindrical, oblong, ovate, or globose, frequently pedicellate, 2–8-spored; spores continuous, colorless, oblong or oval, straight or slightly curved.

KEY TO THE GENERA

I. Perithecia containing a single ascus; asci mostly 8-spored.
   1. Appendages dichotomously branched at the tip.... *Podosphaera*
   2. Appendages simple or obscurely branched..... *Sphaerotheca*

II. Perithecia containing several asci; asci 2–8-spored.
   3. Appendages acicular, bulbous at the base..... *Phyllactinia*
   4. Appendages uncinate or coiled at the tip..... *Uncinula*
   5. Appendages dichotomously branched at the tip..... *Microsphaera*
   6. Appendages simple or obscurely branched..... *Erysiphe*

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PODOSPHAERA Kunze.

Perithecia globose or somewhat flattened; ascus globose to obovate; spores eight; appendages confined to a small apical group or scattered over the upper half of the perithecium, dichotomously branched at the tip, branches simple and straight, or more commonly in our species swollen and knob-like.

KEY TO THE SPECIES

I. Appendages of one kind.
   1. Appendages more or less scattered over the upper half of the perithecium ..... *P. oxyacanthae*
   2. Appendages confined to a small group near the apex of the perithecium ..... *P. tridactyla*

II. Appendages of two kinds..... *P. leucotricha*

PODOSPHAERA OXYACANTHAE (DC.) De Bary.

Erysiphe oxyacanthae DC.
Podosphaera kunzei Lev.

Amphigenous; mycelium variable, persistent in patches, or wholly evanescent; perithecia scattered, or more or less clustered in close groups, sub-globose, 60–90μ in diameter, cells 10–18μ wide; appendages spreading, sometimes equatorially placed, 5–30 in number and from $\frac{1}{2}$ — 10 times the diameter of the perithecium, dark brown for about half their length, septate, tips 2–4 times dichotomously branched, branches usually short and equal, ultimate branches swollen and more or less knob-like, ascus broadly obovate, oblong, or globose, variable in size 58–90 × 45–75μ, thick-walled; spores 8, variable in size 18–30 × 10–17μ.

On: *Amelachier botryapium, Prunus americana, P. besseyi, P. cerasus, P. demissa, P. serotina, P. virginiana.*

Bloomington, Crete, Ewing, Grand Island, Johnstown, Lincoln, Long Pine, Spencer, Naponee, Wabash, Weeping Water, Orleans, Valentine, Callaway, Red Cloud.

This is our most common mildew on wild and cultivated forms of *Prunus*. On *Prunus cerasus* the perithecia are usually hypophyllous, but on the other hosts they are usually epiphyllous or amphigenous.

PODOSPHAERA TRIDACTYLA (Wallr.) De Bary.

Alphitromorpha tridactyla Wallr.
Podosphaera kunzei Lev. (partim)

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Erysiphe tridactyla Tul.

Amphigenous; mycelium evanescent, sometimes sub-persistent; perithecia scattered, or more or less gregarious, sub-globose, 70–100 μ in diameter, cells 10–15 μ wide; appendages 3–10, usually only 4–5, springing in a cluster from the apex of the perithecium, more or less erect, septate, tips 3–5 times dichotomously branched primary branches elongated, ultimate branches rounded or more or less knob-like; ascus globose, 60–80 $\times$ 60–70μ ; spores 8, 20–30 $\times$ 12–15μ.

On: *Prunus americana, P. cerasus.*
Lincoln, Wabash, Weeping Water, York.

The apical insertion of the more or less erect appendages is the character which usually separates this species from *P. oxyacanthae.* It is a question whether this is sufficient ground for making a species for the form, and I have had some hesitation in assigning specific rank to *P. tridactyla* since it is usually regarded as a variety of *P. oxyacanthae.* Salmon regards it as a variety of the latter, and remarks: "The published records of *Podosphaera tridactyla* (Wallr.) from America almost certainly all belong to *P. oxyacanthae,* as the former name has been in error, commonly used by American mycologists as a synonym of the latter species." However the two forms seem sufficiently different to warrant the above treatment in this place. The two forms should be studied further from local material.

PODOSPHAERA LEUCOTRICHA (Ell. & Ever.) Sal.

Sphaerotheca leucotricha Ell. & Ever.
Sphaerotheca mali Burrill.

Amphigenous; mycelium persistent on the young stem, the petioles, and leaves, effused; perithecia densely gregarious, rarely scattered, 75–90μ in diameter, cells 10–16μ wide; appendages of two kinds, the apical ones 3–11, 4–7 times the diameter of the perithecium, becoming thick-walled, dark brown in the lower half, pale toward the tip, tip undivided or blunt, rarely once or twice dichotomously divided; basal appendages short, tortuous, pale brown, simple, or irregularly branched; ascus oblong to sub-globose 55–70 $\times$ 44–50μ; spores 22–26 $\times$ 12–14μ.

On: This species is reported by Heald in the nineteenth annual report of the Nebraska Agricultural Experiment Station

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as occurring on *Malus malus*. In other sections it attacks seedlings in the nursery and at such times often causes damage of considerable extent. Nurserymen should watch for its appearance, and adopt means for its control should it become troublesome.

Sphaerotheca Lev.

Perithecia sub-globose; ascus ovate, globose, or elliptical; spores eight; appendages floccose, not much different from the mycelium, often closely interwoven with the mycelium, brown or colorless, simple or obscurely branched. In some species (*S. pannosa*) thick-walled, interwoven hyphae form a persistent pannose covering for the more or less immersed perithecia.

KEY TO THE SPECIES

I. Mycelium persistent, thick; perithecia more or less immersed in dense patches of the mycelium.
   1. Mycelium shining, white to pale brown..... *S. pannosa*
   2. Mycelium dark brown, hyphae tortuous..... *S. mors-uvae*

II. Mycelium evanescent, not thick and dense, or sometimes more or less persistent.
   3. Perithecia scattered or densely gregarious..... *S. humuli*

Sphaerotheca pannosa (Wallr.) Lev.

Alphitromorpha pannosa Wallr.
Erysiphe pannosa Fr.

Mycelium persistent on the stem calyx, petioles, and sometimes on the mid-ribs of the leaves in dense satiny patches, at first shining white, then gray to buff or light brown, composed of densely interwoven thick-walled hyphae; perithecia more or less, or completely immersed in the persistent mycelium, globose to sub-pyriform, 80–120μ in diameter, usually about 100μ, cells obscure, about 12μ wide; appendages few, sometimes lacking altogether, very short, tortuous, septate, pale brown; ascus broadly oblong to globose, 85–115μ, averaging 100 $\times$ 60–70μ; spores 8, 20–27 $\times$ 12–15μ.

On: *Amygdalus persica, Bidens cernua, Rosa arkansana, R. multiflora, Taraxacum taraxacum*

Lincoln, Pleasant Dale, Red Cloud, Roca, Weeping Water.

This species has been quite commonly confused with *S. humuli*. The present species is however quite well set off from all other

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species of the genus by its pannose, satiny patches of persistent mycelium in which the perithecia are usually completely immersed. *S. pannosa* is our very common "rose mildew." It occurs commonly upon the leaves of various wild species and cultivated varieties. Those plants growing in moist or shady situations are most commonly infected. The disease is rarely destructive to any degree with us, but may become so under especially favorable conditions.

SPAEROTHECA MORS-UVAE (Schwein.) B. & C.

Erysiphe mors-uvae Schwein.
Sphaerotheca pannosa Lev.

Amphigenous; mycelium persistent, when mature forming dense patches composed of sparingly branched, more or less flexuous, brown hyphae, becoming dark brown and thick-walled; perithecia gregarious, more or less immersed in the persistent mycelium, sub-globose, 75–110μ in diameter, cells large, at first well defined then becoming obscure, usually about 15–20μ; appendages usually few, pale brown, short and tortuous, sometimes more numerous and longer, up to five times the diameter of the perithecium; ascus elliptical to sub-globose, 70–92 × 50–62μ; spores 20–25 × 12–15μ.

On: *Ribes aureum, R. floridum, R. grossulariae, R. rotundifolium.*

Anselmo, Calloway, Grand Island, Lincoln, Loup City, St. Paul, Weeping Water, Wood River.

This species may become of considerable importance as a disease of cultivated gooseberries and currants during especially favorable seasons.

SPHAEROTHECA HUMULI (DC.) Burrill.

Erysiphe humuli DC.
Sphaerotheca pruinosa C. & P.
Sphaerotheca castagnei Lev. (partim).

Amphigenous; mycelium usually evanescent, rarely forming white, orbicular or irregular patches on the upper surface of the leaf; perithecia scattered or somewhat gregarious, or caespitose, 55–120μ in diameter, cells small, averaging 15μ wide; appendages very variable, few to numerous, usually long, often nine times the diameter of the perithecium, more or less straight, sep-

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tate and colored dark brown throughout, but sometimes short, tortuous, inter-woven and pale brown, sometimes lacking entirely; ascus broadly elliptical to sub-globose, rarely short-pedicellate, 45–90 × 50–75μ; spores 8, 20–25 × 12–18μ; averaging 22 × 15μ.

On: *Agrimonia hirsuta, Bidens frondosa, B. levis, Geum canadense, Gilia linearis, Rhus glabra, Senecio fremontii, Taraxacum taraxacum.*

Chadron, Cowles, Crete, Grand Island, Hastings, Lincoln, Long Pine, Ord, Red Cloud, Roca, Valentine, Weeping Water.

As here treated this species includes the variety *S. humili fulginea* (Schlecht) Salmon. This variety is about as common as the species. It is distinguished from the species by the larger cells of the outer wall of the perithecium which are about 20–30 wide, while in *S. humili* they are 10–20μ. This parasite which occurs on *Humulus lupulus* in Europe sometimes causes great loss to hop growers. It has been found on this host in America, but has not been reported on this host in Nebraska.

Phyllactinia Lev.

Perithecia large, globose-flattened to lenticular; asci 2- or sometimes 3-spored; appendages few, equatorial, rigid, acicular, with a bulbous inflation at the base. Sometimes a sub-family is made to take this genus as separated from the other genera of the family. In Phyllactinia branches of the mycelium pass through the stomata into the intercellular air spaces and from these branches haustoria are sent into the neighboring cells. In all the other genera the haustoria are confined to the epidermal cells. The genus is represented by a single species.

Phyllactinia corylea (Pers.) Karst.

Phyllactinia guttata (Wallr.)Lev.
Phyllactinia suffulta (Rebent.) Sacc.

Usually hypophyllous, though with us rather commonly amphigenous; mycelium evanescent or sometimes persistent; perithecia usually widely scattered, but now and then gregarious, very large, 150–280μ, globose-depressed to lenticular, cellular structure obscure, cells 15–20μ wide; appendages few, usually five to fifteen, usually equatorial, easily broken off, hyaline, aseptate, swollen at the base into a hollow bulb; asci 4–8, sometimes more, ovate or oblong 60–105 × 25–40μ, more or less pedicel-

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late; spores 2, rarely 3 or 4, variable in size, usually large, sometimes curved, 30–42 × 16–25μ.

On: *Aralia nudicaulis, Celastrus scandens, Cornus stolonifera, Fraxinus lanceolata, Ostrya virginiana, Xanthoxylum americanum.*

Ashland, Crete, Florence, Fort Niobrara, Gordon, Lincoln, Long Pine, Omaha, Saltillo, Wabash, Weeping Water, Valentine.

This species is very readily recognized by the larger perithecia which are very commonly lens-shaped, with a fringe of clear appendages with inflated bases.

Uncinula Lev.

Perithecia globose to globose-flattened; asci several, 2–8-spored; appendages simple and free from the mycelium, recurved or coiled at the tip.

KEY TO THE SPECIES

I. Appendages colored for more than half their length.
   1. Asci 4–6, 4–7-spored, appendages variable, 6–35.. *U. necator*

II. Appendages colorless for their whole length.
   2. Asci 8–20, 2-spored, appendages 50–125..... *U. macrospora*
   3. Asci 8–15, 4–6-spored, appendages 100–150..... *U. salicis*
   4. Asci 10–26, 7–8-spored, appendages densely crowded, *U. circinata*

Uncinula necator (Schwein.) Burrill

Erysiphe necator Schwein.
Uncinula spiralis B. & C.
Uncinula ampelopsidis Peck.

Amphigenous; mycelium sub-persistent, thin and effused, or forming circumscribed patches, sometimes evanescent; perithecia usually epiphyllous or sometimes hypophyllous as well, occasionally on the inflorescence of the host, globose-depressed, more or less scattered, 70–128μ in diameter, averaging 98μ, cells distinct, irregular in shape, 10–20μ wide; appendages very variable in number and length, 6–35, one to four times the diameter of the perithecium, smooth, simple, septate, thin-walled, light or dark brown in the lower half, tip helicoid when mature; asci 4–6, ovate or ovate-oblong to sub-globose 50–60 × 30–40μ; spores 4–7, 18–25 × 10–12μ.

On: *Parthenocissus quinquefolia, Vitis cordifolia, V. riparia, V. sps.*

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Crete, Florence, Lincoln, Saltillo, Weeping Water.

Uncinula macrospora Peck

Uncinula intermedia B. & C.

Amphigenous; mycelium evanescent or sub-persistent, and pruinose, sometimes forming circumscribed patches on the upper surface of the leaf; perithecia closely gregarious in small patches, or scattered over the surface, globose-depressed or lenticular, 95–165μ in diameter, averaging 130μ, cells about 10μ wide; appendages numerous, 50–130 or more, varying in length from one-third the diameter of the perithecium to a little more than its diameter, smooth, colorless, aseptate, simple, thick-walled at the base, tip usually simply uncinate; asci 8–20, sub-pryiform or elliptic oblong, often curved, 54–65 $\times$ 29–35μ; spores 2, 30 $\times$ 15–18μ.

On: *Ulmus americana.*

Crete, Elmwood, Grand Island, Lincoln, Nehawka, Plattsmouth, Roca, Saltillo, Union, Wabash, Weeping Water.

Uncinula salicis (DC.) Winter

Erysiphe salicis DC.
Uncinula adunca Lev.

Amphigenous; mycelium evanescent, or persistent in thin effused areas or sometimes densely compacted in definite circumscribed patches; perithecia gregarious, or more or less scattered, globose-depressed or lenticular, 90 $\times$ 175μ in diameter, averaging 135μ, cells 10–15μ wide; appendages numerous, often densely crowded, 100–150 or more, three-fourths to one and one-half times the diameter of the perithecium, simple, aseptate, or occasionally 1–septate at the base, hyaline and thin-walled throughout, tip simply uncinate; asci 8–14, rarely only 4–6, elliptic-oblong or broadly ovate, usually pedicellate, 50–80 $\times$ 30–40μ, averaging 68 $\times$ 36μ; spores 4–6, 20–26 $\times$ 10–15μ.

On: *Salix amygdaloides, S. cordata, S. fluviatalis, S. humulis, S. nigra, S. sp., Populus deltoides*

Ashland, Crete, Lincoln, Long Pine, Milford, Valentine, Wabash, Weeping Water.

Uncinula circinata Cook & Peck

Hypophyllous or sometimes with us amphigenous; mycelium evanescent or sub-persistent on the upper surface of the leaf, sometimes forming definite spots; perithecia usually scattered,

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sometimes gregarious, globose-lenticular, 160–225μ in diameter, averaging 190μ, cells obscure, irregular, 10 × 14μ wide; appendages very numerous, usually densely crowded, a little shorter than the diameter of the perithecium, simple, smooth, aseptate, thin-walled and hyaline throughout, tip simply uncinate; asci 10–26, usually about 15, narrowly ovate or cylindrical, with or without a short pedicel, 68–86 × 29–40μ; spores 8, 18–22 × 10–14μ.

On: *Acer saccharinum.*
Burwell, Crete, Lincoln, Wabash, Weeping Water.

Sometimes the appendages in this species are scarcely if at all uncinate and are more or less irregular. Perithecia with appendages of this nature are about as common with us as those with the typical form. Such specimens might possibly be mistaken for those of a species of *Erysiphe.*

Microsphaera Lev.

Perithecia globose to globose-flattened; asci several, two to eight spored; appendages free from the mycelium, branched at the tip in a definite manner, usually several times dichotomously divided and very often ornate.

KEY TO THE SPECIES

I. Appendages much contorted and angular, branches very irregular and flexuous ..... *M. euphorbiae*
II. Appendages not as above.
  1. Appendages regularly dichotomous, tips recurved. *M. alni*
  2. Appendages openly dichotomous, colored, tips not recurved, *M. russellii*
  3. Appendages colorless, not penicillate.
    1) Branches lax, irregular, ultimate branches long, *M. diffusa*
    2) Branches closer, regular, ultimate branches short, *M. grossulariae*

Microsphaera euphorbiae (Peck) B. & C.

Erysiphe euphorbiae Peck.

Amphigenous; mycelium usually sub-persistent, thin and effused, sometimes evanescent; perithecia often gregarious in floccose patches, sometimes scattered, 85–145μ in diameter, rarely 180μ globose-depressed, cells 10–15μ wide; appendages 7–28, 2½–8 times the diameter of the perithecium, always flexuous and no-

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dose, colorless aseptate, tip 3–4 times dichotomously branched, branching very irregular and lax, branches strongly flexuose, often more or less curled, tips of ultimate branches straight or curved; asci 4–13, rarely more, ovate or ovate-oblong, with a short pedicel, 48–66 × 26–35μ; spores usually 4, sometimes only 3, or sometimes 5–64, 19–21 × 10–12μ.

On: *Euphorbia marginata.*
Cass County, Red Cloud, Riverton.

MICROSPHAERA *alni* (Wallr.) Winter.

Alphitromorpha alni Wallr.
Microsphaera quercina (Schwein.) (Burrill) (partim).

Amphigenous; mycelium evanescent or persistent in thin, more or less effused areas over the surface of the leaf; perithecia scattered or more or less densely gregarious, globose-depressed, very variable in size, usually small, 66–110μ in diameter, sometimes 110–135μ, cells 10–15μ wide; appendages very variable in number and length, 4–26, ⅓ to 2½ times the diameter of the perithecium, colorless throughout or more or less amber colored at the base, aseptate or sometimes 1–2-septate toward the base, tip more or less closely 3–6 times dichotomously branched, tips of the ultimate branches regularly and distinctly recurved; asci 3–8, ovate to ovate-oblong, or globose, 42–70 × 32–50μ, usually pedicellate; spores 4–8, 18–23 × 10–12μ.

On: *Lathyrus odoratus, Lonicera gloucescens, Quercus macrocarpa, Q. rubra, Syringa vulgaris, S. chinensis.*
Ashland, Florence, Long Pine, Loup City, Lincoln, Wabash, Weeping Water, St. Paul, Riverton.

MICROSPHAERA ALNI var. vaccinii (Schwein.) Salmon.

Microsphaera elevata Burrill.
Erysiphe vaccinii Schwein.

Generally epiphyllous; mycelium persistent or sometimes evanescent; perithecia globose or globose-depressed, very variable in size, 70–145μ in diameter, cells 10–20μ wide; appendages 4–22, 2½ times the diameter of the perithecium, delicate and thin, hyaline or occasionally amber-brown at the base, 2–4 times dichotomously branched, branching variable, irregular, sometimes close and compact, sometimes loose and widely forked, ultimate branches recurved; asci 2–16, 45–72 × 28–38μ; spores 4–6, 18–22 × 10–13μ.

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On: *Catalpa catalpa, C. speciosa.*
Lincoln, Wabash, Weeping Water.

This variety is an extremely variable form. It occurs in the east on species of *Vaccinium,* and on *Epigaea.* Salmon writes in regard to the form: "On the whole, the present plant appears clearly marked off from typical *M. alni* by the long, flaccid appendages, and their usually more irregularly branched apex." The perithecia are usually smaller than in *M. alni.*

MICROSPHAERA RUSSELLII Clinton.

Amphigenous; mycelium evanescent or sub-persistent, usually inconspicuous; perithecia scattered, 70–118μ in diameter, globose-depressed, cells small, 6–14μ wide appendages 5–14, 3–7 times the diameter of the perithecium, flaccid septate, smooth, colored nearly to the tip when mature, tip 2–4 times dichotomously divided, branching very irregular and lax, primary branches usually long and widely forking, tips of ultimate branches not recurved; asci 4–9, narrowly to broadly ovate, short-pedicellate, 42–56 × 24–32μ; spores 3–5, usually 4, 18–22 × 10–12μ.

On: *Oxalis corniculata, O. cymosa, O. stricta.*
Crete, Lincoln, Naponee, Valentine, Weeping Water.

MICROSPHAERA DIFFUSA Cook & Peck.

Microsphaera symphoricarpi Howe.

Amphigenous; mycelium persistent, thin and effused, sub-persistent, or in some cases evanescent; perithecia scattered or gregarious, globose-depressed, very variable in size, 55–126μ in diameter, averaging 90–100μ, cells 10–20μ wide; appendages very variable in number and length, 4–30, 1½–7 times the diameter of the perithecium, smooth, aspetate, or 1–3-septate in the lower half, colorless or pale brown toward the base, tip 3–5 times dichotomously divided, branching diffuse and irregular, branches of the higher orders sub-nodulose, tips of the ultimate branches not recurved; asci 4–9, 48–60 × 28–30μ, ovate-oblong with a very short pedicel; spores 3–6, usually 4, 18–22 × 9–11μ.

On: *Apios apios, Falcata comosa, Glycyrrhiza lepidota, Meibomia canescens, M. canadense, M. grandiflorum, Symphoricarpos occidentalis, S. symphoricarpos.*

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Burwell, Crete, Grand Island, Lincoln, Long Pine, Red Cloud, Roca, Scotia, Valentine, Wabash, Weeping Water.

MICROSPHAERA GROSSULARIAE (Wallr.) Lev.

Alphitromorpha grossulariae Wallr.
Erysiphe grossulariae (Lev.) De Bary.

Epiphyllous or amphigenous; mycelium evanescent, or subpersistent, thin and effused on the upper surface of the leaf; perithecia scattered or densely gregarious, globose-depressed, very variable in size, 60–130μ in diameter, cells 14–20μ wide; appendages 5–22, 1–1¾ times the diameter of the perithecium, colorless, aseptate, tip 4–5 times closely and regularly dichotomously branched, branches of the first and second orders very short, all of the segments deeply divided, ultimate branches forming a narrow fork, tips not recurved; asci 4–10, broadly ovate or oblong, usually with a very short pedicel, 46–62 × 28–38μ; spores 4–6, variable in size, 20–28 × 12–16μ.

On: *Sambucus canadensis.*

Crete, Fremont, Grand Island, Weeping Water.

While with us *M. grossulariae* is confined to the elder, *Sambucus canadensis*, in Europe it attacks the cultivated goose-berry, and sometimes becomes quite destructive. It has not been reported on Ribes from Nebraska as yet. Our common gooseberry mildew is *Sphaerotheca mors-uvae.*

ERYSIPHE Hedw.

Perithecia globose, or globose-flattened; asci several, 2–8-spored; appendages floccose, simple or obscurely branched, usually more or less similar to the mycelium and interwoven with it.

KEY TO THE SPECIES

I. Mature perithecia not containing spores on the living host.
  1. Perithecia large, 140–280μ, in diameter, more or less immersed in the lanuginose, persistent mycelium.... *E. graminis*
  2. Perithecia smaller, 80–140μ, not immersed in the mycelium.
    1) Haustoria lobed, asci 8-spored..... *E. galeopsidis*
    2) Haustoria not lobed, asci 2-spored..... *E. cichoracearum*

II. Mature perithecia containing spores on the living host.
  3. Appendages often interwoven with the mycelium, *E. polygoni*
  4. Appendages densely interwoven with the mycelium, haustoria not lobed ..... *E. cichoracearum*

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ERYSIPHE GRAMINIS DC.

Usually epiphyllous, sometimes amphigenous; mycelium subpersistent, effused or in scattered patches, at first white, later becoming gray or pale brown; perithecia large, 130–280μ in diameter, scattered or gregarious, somewhat depressed, sometimes becoming concave, usually immersed in the lanuginose, persistent mycelium; cells of the perithecium obscure; appendages poorly developed, few or many, very short, sparingly branched, brownish; asci numerous, 10–30, usually about 15, cylindric to ovate-oblong, more or less pedicellate, 70–100 × 25–40μ; spores 8, (sometimes 4) 20–25 × 10–13μ.

On: *Poa pratensis, Secale cereale, Triticum* sps.
Lincoln, Red Cloud, St. Paul, Wabash, Weeping Water.

ERYSIPHE GALEOPSIDIS DC.

On: *Stachys palustris, Scutellaaria lateriflora.*
Crete, Weeping Water.

This plant is sometimes described as a distinct species, but for the present I prefer to regard it as a mere form of *E. cichoracearum.* It is very much like *E. cichoracearum.* It is probable that *E. galeopsidis* contains only those forms of *E. cichoracearum* on the hosts named, and on which the spores in the perithecia do not mature on the living host.

ERYSIPHE CICHORACEARUM *DC.*

Erysiphe lamprocarpa Lev.
Erysiphe spadacea B. & C.

Amphigenous; mycelium usually evanescent or sometimes subpersistent and effused, white; perithecia sub-globose, or globose-depressed, often becoming concave, gregarious or scattered, 89–140μ in diameter, cells variable in size, usually very distinct, 10–20μ wide, sometimes smaller and obscure; appendages variable, long or short, brown or colorless, numerous, densely interwoven, branched, septate, light or brown throughout, two to four times the diameter of the perithecium; asci numerous, 10–15 or more, variable in size and shape, from narrowly ovate to broadly ovate, or rarely subglobose, more or less pedicellate, 60–90 × 30–50μ; spores 2, 20–28 × 12–20μ, usually about 24 × 14μ.

On: *Ambrosia artemisiaefolia, A. trifida, A. psilostachya, Aster ericoides, A. nebraskensis, A. laevis, A. multiflorus, A. paniculatus, Carduus altissimus, C. discolor, Bidens fron-*

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dosa, Boebera papposa, Eupatorium purpureum, E. ageratoides, Galium aparine, Grindelia squarrosa, Helianthus annuus, H. decapetalus, H. tuberosus, Heliopsis scabra, Helenium autumnale, Hydrophyllum virginicum, Iva xanthifolia, Lappula virginiana, Papaver rhoeas, Parietaria pennsylvanica, Phlox paniculata, Plantago major, P. rugelli, Rudbeckia laciniata, Solidago canadensis, S. mollis, S. rigida, Tragopogon porrifolius, Verbena bracteosa, V. hastata, V. stricta, V. urticifolia, Verbesina alternifolia, Vernonia fasiculata, Xanthium canadense.

Atkinson, Boelus, Callaway, Crete, Chadron, Elmwood, Florence, Fremont, Greeley, Hastings, Harrison, Lincoln, Long Pine, Loup City, Naponee, Riverton, Saltillo, Wabash, Weeping Water, Wood River, Warbonnet Canyon, Valentine, Red Cloud, Bloomington, St. Paul, Simeon, Burwell, Ainsworth, Calloway.

ERYSIPHE POLYGONI DC.

Erysiphe communis (Wallr.) Fr.

Amphigenous mycelium very variable, persistent, thin, effused, and arachnoid, or rarely thick, dense and lichenoid, often completely evanescent; perithecia gregarious to scattered, small, 65–180μ, usually about 90μ, cells usually distinct, 10–15μ wide; appendages very variable in number and length, sometimes few (3–7), distinct and long, or more rarely few and short, usually numerous and crowded, more or less densely interwoven, and long or short, always spreading horizontally, often interwoven with the mycelium, simple or branched, dark, or brown at the base or throughout, or almost colorless; asci usually few, 2–8, sometimes many, usually small and ovate, but varying from ovate to broadly ovate or globose, sessile or with a short pedicel, 46–72 $\times$ 30–45μ; spores 3–8, 19–25 $\times$ 9–14μ.

On: *Anogra pallida, Aquilegia vulgaris, Aster nebraskensis, Astragalus adsurgens, A. canadensis, A. sp., Brassica napus, Clematis virginiana, Falcata comosa, Lotus americanus, Muhlembeckia platyclados, Oenothera laciniata, Onagra biennis, Pisum sativum, Polygonum aviculare, P. ramosissimum, Ranunculus abortivus, R. cymbalaria, R. delphinifolius, Thalictrum purpurascens, Polygonum aviculare.*

Belmont, Central City, Chadron, Crawford, Crete, Hastings, Lincoln, Ord, Port Niobrara, Red Cloud, St. Paul, Valentine,

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Wabash, Weeping Water, Wood River, Grand Island, Orleans, Kennedy, Long Pine, Scotia.

This is our most variable species of the Erysiphaceae. It is most common and most variable with us on *Polygonum aviculare.* However it is also quite common on *Clematis virginiana.*

This paper constitutes the first publication in recent years dealing with a particular group of the local fungus flora with keys and specific descriptions. It must not be supposed for a moment that the above treatment contains the limit of our knowledge of the Erysiphaceae of Nebraska. It represents merely the sum of our present knowledge of the group, and in this way an attempt has been made to put the already known facts in regard to the group before the botanists and mycologists of the state. It is hoped that the paper may constitute the nucleus about which future and more systematic studies may be made, until sometime not far distant we may issue a fairly complete treatment of the Erysiphaceae of the state. I doubt not that there are other species of the group not mentioned here to be found in the state. Certainly the list of host plants will be considerably enlarged by future study. Probably not all of the present existing hosts for the various species have been listed here, but if not, it is because they have not been reported or placed in the Survey Herbarium or in the general fungus collection which contains all of the important exsiccati, and which have been studied during the preparation of the present treatise.

The enthusiastic and untiring work of Rev. J. M. Bates shows what the collector out in the state may do in extending the knowledge of the local flora. After many years' study of the seed plants of the state he undertook to learn something of the fungi. He has learned much during the years in which he has made extensive collections. Much of the information as to range and hosts of the various species in the above pages should be credited to him.

It is planned to publish as rapidly as possible progress reports on various groups of fungi for the state until the whole of the fungus flora shall have been studied. The writer solicits

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specimens of fungi of every sort. All such specimens will be carefully preserved and will be included in the proper publication when sufficient material is at hand to warrant its publication. So additional specimens and hosts of the Erysiphaceae, or corrections in the present paper will be gratefully received. All specimens of fungi should be accompanied in so far as possible by the name of the host, or with sufficient material that the host may be determined. For those fungi which do not have any particular host plant the general nature of the substratum should be indicated.

HOST INDEX.

ABBREVIATIONS: E.—Erysiphe, M.—Microsphaera, Ph.—Phyllactinia, P.—Podosphaera, S.—Sphaerotheca, U.—Uncinula.

Acer dasycarpum Ehrh. See Acer saccharinum L.
Acer saccharinum L. ..... U. circinata
Actinomeris squarrosa Nutt. See Verbesina alternifolia (L.) Britton.
Agrimonia hirsuta (Muhl.) Bichnell ..... S. humuli
Amelanchier botryapium (L. f.) DC. ..... P. oxyacanthae
Ambrosia artemisiaefolia L. ..... E. cichoracearum
Ambrosia psilostachya DC. ..... E. cichoracearum
Ambrosia trifida L. ..... E. cichoracearum
Ampelopsis quinquefolia Michx. See Parthenocissus quinquefolia (L.) Planch.
Amygadalus persica L. ..... S. pannosa
Anogra pallida (Lindl.) Britton ..... E. polygoni
Apios apios (L.) MacM. ..... M. diffusa
Aquilegia vulgaris L. ..... E. polygoni
Aralia nudicaulis L. ..... Ph. corylea.
Aster ericoides L. ..... E. cichoracearum
Aster multiflorus Burgess ..... E. cichoracearum
Aster laevis L. ..... E. cichoracearum
Aster nebraskensis Britton ..... E. polygoni
Aster nebraskensis Britton ..... E. cichoracearum
Aster paniculatus Lam. ..... E. cichoracearum
Astragalus adsurgens Pall. ..... E. polygoni
Astragalus canadensis L. See Astragalus carolinianus L.
Astragalus carolinianus L. ..... E. polygoni
Astragalus sp. ..... E. polygoni
Bidens cernua L. ..... S. pannosa.
Bidens frondosa L. ..... S. humuli
Bidens laevis (L.) B.S.P. ..... S. humuli
Boebera papposa (Vent.) Rydb. ..... E. cichoracearum

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Brassica napus L. ..... E. polygoni
Carduus discolor (Muhl.) Nutt. ..... E. cichoracearum
Catalpa catalpa (L.) Karst. ..... M. alni vaccinii
Catalpa speciosa Warder. ..... M. alni vaccinii
Celastrus scandens L. ..... Ph. corylea.
Clematis virginiana L. ..... E. polygoni
Cnicus altissimus Willd. See Carduus altissimus L.
Collomia linearis Nutt. See Gilia linearis (Nutt.) Gray.
Cornus stolonifera Michx. ..... Ph. corylea.
Desmodium canadense DC. See Meibomia canadensis (L.) Kuntze.
Desmodium canescens L. See Meibomia canescens (L.) Kuntze.
Desmodium grandiflorum (Walt.) DC. See Meibomia grandiflorum (Walt.) Kuntze.
Dysodia papposa (Vent.) Hitc. See Boebera papposa (Vent.) Rydb.
Eupatorium ageratoides L. ..... E. cichoracearum
Eupatorium purpurem L. ..... E. cichoracearum
Euphorbia marginata Pursh. ..... E. euphorbiae
Falcata comosa (L.). Kuntze. ..... E. polygoni
Falcata comosa (L.) Kuntze. ..... M. diffusa
Fraxinus lanceolata Berk. ..... Ph. corylea.
Fraxinus viridis Michx. See Fraxinus lanceolata Berk.
Galium aparine L. ..... E. cichoracearum
Geum album J. F. Gmel. See Geum canadense Jacq.
Geum canadense Jacq. ..... S. humuli
Gilia linearis (Nutt.) Gray. ..... S. humuli
Glycyrrhiza lepidota Pursh. ..... M. diffusa
Grindelia squarrosa (Pursh.) Dunal. ..... E. cichoracearum
Helianthus annuus L. ..... E. cichoracearum
Helenium autumnale L. ..... E. cichoracearum
Helianthus decapetalus L. ..... E. cichoracearum
Helianthus tuberosus L. ..... E. cichoracearum
Heliopsis scabra Dunal. ..... E. cichoracearum
Hydrophyllum virginicum L. ..... E. cichoracearum
Iva xanthifolia (Fresen.) Nutt. ..... E. cichoracearum
Lotus americanus (Nutt.) Bisch. ..... E. polygoni
Lappula virginiana (L.) Greene. ..... E. cichoracearum
Lathyrus odoratus L. ..... M. alni
Lonicera glaucescens Rydb. ..... M. alni
Malus malus (L.) Britton. ..... P. leucotricha
Meibomia canadensis (L.) Kuntze. ..... M. diffusa
Meibomia canescens (L.) Kuntze. ..... M. diffusa
Meibomia grandiflorum (Walt.) Kuntze. ..... M. diffusa
Muhlenbeckia platyclados Meissn. ..... E. polygoni
Oenothera biennis L. See Onagra biennis (L.) Scop.

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Oenothera laciniata Hill..... E. polygoni
Onagra biennis (L.). Scop..... E. polygoni
Ostrya virginiana (Mill.) Willd..... Ph. corylea.
Oxalis corniculata L..... M. russellii
Oxalis cymosa Small..... M. russellii
Oxalis stricta L..... M. russellii
Papaver rhoeas L..... E. cichoracearum
Parietaria pennsylvanica Muhl..... E. cichoracearum
Parthenocissus quinquefolia (L.) Planch..... U. necator
Phlox paniculata L..... E. cichoracearum
Pisum sativum L..... E. cichoracearum
Plantago major L..... E. cichoracearum
Plantago rugelii Dec..... E. cichoracearum
Poa pratensis L..... E. graminis
Polygonum aviculare L..... E. polygoni
Polygonum ramosissimum Michx..... E. polygoni
Populus deltoides Marsh ..... U. salicis
Populus monilifera Ait. See Populus deltoides Marsh.
Prunus americana Marsh..... P. oxyacanthae
Prunus americana Marsh..... P. tridactyla
Prunus besseyi Bailey..... P. oxyacanthae
Prunus cerasus L..... P. oxyacanthae
Prunus cerasus L..... P. tridactyla
Prunus demissa (Nutt.) Walp..... P. oxyacanthae
Prunus serotina Ehrh..... P. oxyacanthae
Prunus virginiana L..... P. oxyacanthae
Pyrus malus L. See Malus malus (L.) Britton.
Quercus macrocarpa Michx..... M. alni
Quercus rubra L..... M. alni
Ranunculus abortivus L..... E. polygoni
Ranunculus cymbalaria Pursh..... E. polygoni
Ranunculus delphinifolius Torr..... E. polygoni
Ranunculus multifidus Pursh. See Ranunculus delphinifolius Torr.
Rhus glabra L..... S. humuli
Ribes aureum Pursh..... S. mors-uvae
Ribes floridum L'Her..... S. mors-uvae
Ribes grossulariae L..... S. mors-uvae
Ribes rotundifolium Michx..... S. mors-uvae
Rosa arkansana Porter..... S. pannosa.
Rosa multiflora Thunb..... S. pannosa.
Rudbeckia laciniata L..... E. cichoracearum
Salix amygdaloides Anders..... U. salicis
Salix cordata Muhl..... U. salicis
Salis fluviatalis Nutt..... U. salicis

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Salix humilis Marsh..... U. salicis
Salix nigra Marsh..... U. salicis
Salix sp..... U. salicis
Sambucus canadensis L..... M. grossulariae
Scutellaria lateriflora L..... E. galeopsidis
Secale cereale L..... E. graminis
Senecio fremontii (T. & G.) Rydb..... S. humuli
Solidago canadensis L..... E. cichoracearum
Solidago mollis Bartl..... E. cichoracearum
Solidago rigida L..... E. cichoracearum
Stachys palustris L..... E. galeopsidis
Symphoricarpos symphoricarpus (L.) MacM..... M. diffusa
Symphoricarpos vulgaris Michx. See Symphoricarpos symphoricarpos (L.) Macm.
Symphoricarpos occidentalis Hook..... M. diffusa
Syringa chinensis Willd..... M. alni
Syringa vulgaris L..... M. alni
Taraxacum taraxacum (L.) Karst..... S. pannosa.
Taraxacum taraxacum (L.) Karst..... S. humuli
Thalictrum purpurascens L..... E. polygoni
Tragapogon porrifolius L..... E. cichoracearum
Triticum sp..... E. graminis
Ulmus americana L..... U. macrospora
Verbena bracteosa Michx..... E. cichoracearum
Verbena hastata L..... E. cichoracearum
Verbena stricta Vent..... E. cichoracearum
Verbena urticifolia L..... E. cichoracearum
Verbesina alternifolia (L.) Britton..... E. cichoracearum
Vernonia fasciculata Michx..... E. cichoracearum
Vitis cordifolia Michx..... U. necator
Vitis riparia Michx..... U. necator
Vitis vulpina L. See Vitis riparia Michx.
Vitis sp..... U. necator
Xanthium canadense Mill..... E. cichoracearum
Xanthoxylum americanum Mill..... E. cichoracearum
Zanthoxylum americanum L. See Xanthoxylum americanum Mill.

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Synonyms are in italics.

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The above is by no means a complete bibliography of the Erysiphaceae. These few references are given as an aid to the student in working out something more of the details in regard to this particular group of fungi. For a more complete list of the literature on the group see the above articles, especially Salmon's monograph and Harper's Carnegie publication.

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EXPLANATION OF PLATES.

PLATE I. The round of life in the Erysiphaceae.

Fig. 1. Germination of an ascospore.
Fig. 2. Portion of mycelium with conidiophore and chain of conidiospores.
Fig. 3. Germination of a conidiospore.
Fig. 4. Tips of two hyphae with cross walls.
Fig. 5. Later stages of same with oögone and antherid well begun.
Fig. 6. Oögone and antherid fully developed.
Fig. 7. Conjugation.
Fig. 8. Carpogone with first layer of cover cells.
Fig. 9. Carpogone with two layers of cover cells.
Fig. 10. Elongation and division of carpogone.
Fig. 11. Perithecium with outer and inner walls, rudimentary appendages, ascus and ascospores.
Fig. 12. A single ascus with ascospores.

Figures 6–10 are modified after Harper and others.

PLATE II. General structure.

Fig. 13. Perithecium of *Microsphaera* with appendages.
Fig. 14. Perithecium of *Uncinula* with appendages.
Fig. 15. Tip of an appendage from *Microsphaera grossulariae.*
Figs. 16 and 17. Haustoria.
Fig. 18. Perithecium of *Podosphaera* with appendages.
Figs. 19, 20 and 21. Variations in the tip of the appendage of *Uncinula.*
Fig. 22. Perithecium of *Erysiphe* or *Sphaerotheca* with appendages.
Fig. 23. Perithecium of *Phyllactinia* with appendages.

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PLATE 1

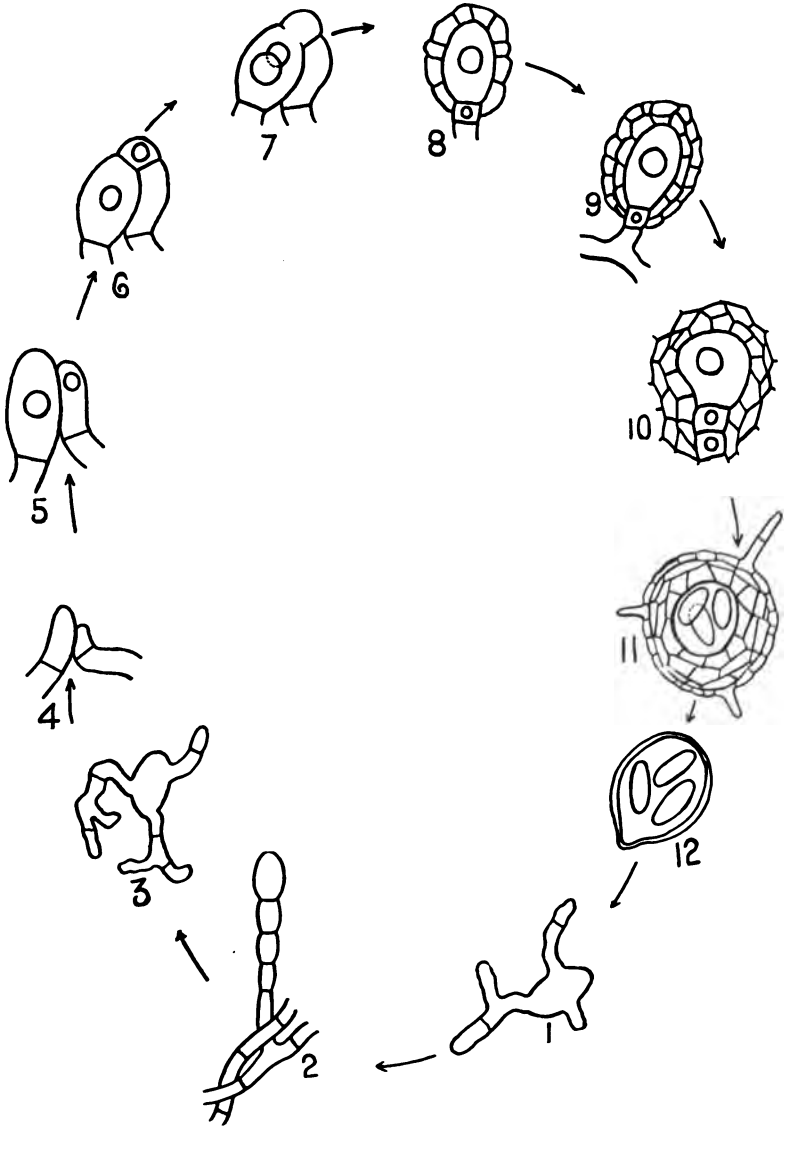

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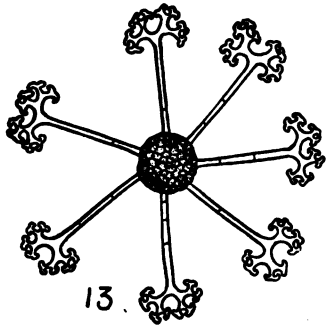
PLATE 2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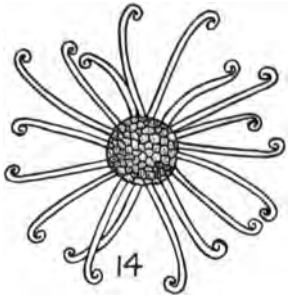
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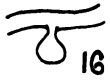
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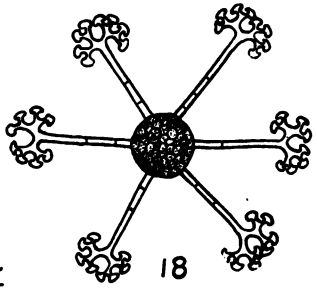
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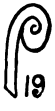
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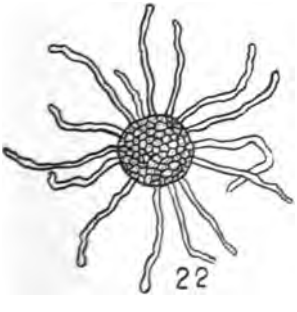
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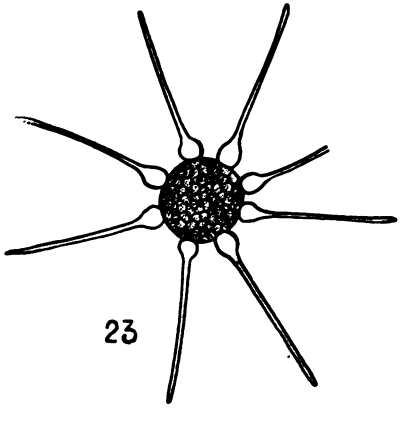
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UNIVERSITY STUDIES

VOL. X *APRIL 1910* No. 2

THE APHIDIDAE OF NEBRASKA

BY THOMAS ALBERT WILLIAMS

The present paper is being published posthumously, having been presented to the University of Nebraska in 1891 by Mr. Williams as a thesis to fulfil part of the requirements of a minor in entomology for the degree of master of arts, and remaining still unpublished at the time of his death, which occurred December 23, 1900. It was expected at the time of presentation that the thesis would be published at an early date and, while engaged in completing it, Mr. Williams prepared as *Special Bulletin* No. 1 of the Department of Entomology, University of Nebraska, a preliminary "Host-Plant List of North American Aphididae," in which he included not only a complete summary of the previously recorded food plants of our aphid fauna but also all of his original personal observations, which course necessitated the use of his manuscript names of new species. This list was published July 8, 1891. While such publication would hardly be expected to establish priority, these names are somewhat different from the ordinary *nomina nuda* in the fact that they referred to insects found feeding upon definite and frequently characteristic host-plants, and moreover the complete specific descriptions were at the time all prepared and reposing in manuscript form in the archives of the University of Nebraska. The recent intensive study of the Aphididae which is being carried on by several specialists in this country has made it very desirable that Mr. Williams' names be substantiated by the publication of his de-

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scriptions, and these are herewith presented exactly as he left them.

In explanation of Mr. Williams' taxonomic methods it is necessary to state that when he collected a number of aphids he mounted them upon as many slides as it took to do so properly and drew up his descriptions from these slides collectively, so that each slide became in fact a cotype except in a few cases where all the specimens were mounted upon a single slide and consequently that slide became his type. Sometimes he marked his slides of cotypes "types" and sometimes he omitted doing so. Sometimes there are two or three slides of the same new species all marked "type." Mr. Williams deposited nearly complete sets of his material both in the collections of the University of Nebraska and in the United States National Museum, and the numbers referred to in designating type slides are those of these two series which are numbered independently and in a different sequence.

In the "Host-Plant List" the following names were referred to as representing new species: *Pemphigus alnifoliae, oenotherae, walshii; Lachnus flocculosa, rileyi, smilacis; Callipterus ulmifolii; Chaitophorus bruneri, cordatae, salicis; Aphis artemisicola, canae, chrysanthemicola, cnici, lilicola, lonicericola, lugentis, parthenocissi, saniculae, sativae, senecionis, solidaginifoliae, yuccicola; Myzus oenotherae, potentillae, thalictri; Rhopalosiphum dianthi poae; Siphonophora artemisicola, carnosa impatientis, chrysanthemicolens, desmodii, eupatorii, gaurae, garrina, grindeliae, luteola; Phorodon cyanoglossi, monardae; Cryptosiphum canadensis.* In addition to these forms mentioned in the "Host-Plant List," Mr. Williams discovered and described two other species, *Pemphigus balsamiferae* and *Aphis pentstemonis* and specimens of these species are in both collections. Of the species included in the "Host-Plant List" one, *Callipterus ulmifolii,* had previously been described by Monell and was so regarded by Williams in his thesis, its appearance in the "Host-Plant List" as a new species being probably a *lapsus pennae.* The "Host-Plant List" mentions *Chaitophorus salicis* and *Pemphigus oenotherae* as new

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TYPES AND COTYPES OF T. A. WILLIAMS' SPECIES IN THE COLLECTIONS OF THE UNIVERSITY OF NEBRASKA AND OF THE U. S. NATIONAL MUSEUM

Species	Type or cotype		Exact date on label	Whether labeled as type or cotype
Pemphigus alnifoliae	Cotype	Neb. no. 4 U. S. no. 120	6/21/90	labeled only "n. sp."
Pemphigus balsamiferae	Cotype	Neb. no. 5 U. S. no. 121	6/24/90	labeled only "n. sp."
Lachnus ponderosae	Cotype	Neb. no. 24 U. S. no. 78	6/20/90	labeled only "n. sp."
Lachnus rileyi	Type	U. S. no. 79		
Lachnus smilacis	Type	U. S. no. 77		
Chaitophorus bruneri	Cotype	Neb. no. 25 U. S. no. 38	6/21/90	labeled only "n. sp."
Chaitophorus cordatae	Type	U. S. no. 39	6/24/90	
Aphis artemisicola	Cotype	Neb. no. 53 U. S. no. 56	6/24/90	labeled "n. sp."—"type"
Aphis canae	Cotype	Neb. no. 54 U. S. no. 60	6/24/90	labeled "n. sp."—"type"
Aphis chrysanthemicola	Cotype	Neb. no. 55, 56	12/30/90	labeled only "n. sp."
Aphis cnici	Cotype	Neb. no. 57 U. S. no. 64	6/22/90	labeled "n. sp."—"type"
Aphis lilicola	Cotype	Neb. no. 67, 68 U.S. no. 85	1/12/91	labeled "n. sp."—"type"
Aphis longicericola	Cotype	Neb. no. 70 U. S. no. 87	5/14/90	labeled only "n. sp."
Aphis lugentis	Cotype	Neb. no. 71 U. S. no. 91	6/23/90	labeled "n. sp."—"type"

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Species	Type or cotype	Exact date on label	Whether labeled as type or cotype
Aphis parthenocissi	Cotype Neb. no. 81, 82 U. S. no. 101	8/7/90	labeled only "n. sp."
Aphis pentstemonis	Cotype Neb. no. 83, 84 U. S. no. 102	6/23/90	labeled only "n. sp."
Aphis saniculae	Cotype Neb. no. 86 U. S. no. 109	6/21/90	labeled "n. sp."—"type"
Aphis sativae	Cotype Neb. no. 87 U. S. 108	10/10/88	labeled "n. sp."—"type"
Aphis senecionis	Cotype Neb. no. 88 U. S. 110	6/20/90	labeled only "n. sp."
Aphis solidaginifoliae	Cotype Neb. no. 91, 92 U. S. no. 111	9/20/90	labeled only "n. sp."
Aphis yuccicola	Cotype Neb. no. 97, 98, 99 U. S. no. 319	6/18/90	labeled "n. sp."—"type"
Myzus oenotherae	Cotype Neb. no. 103, 104 U. S. no. 134, 397	5/30/90	labeled only "n. sp."
Myzus potentillae	Cotype Neb. 107, 108 U. S. no. 376	5/24/90	labeled only "n. sp."
Myzus thalictri	Cotype Neb. no. 111, 112 U. S. no. 139, 140	6/21/90	labeled only "n. sp."
Rhopalosiphum dianthi var. poae	Cotype Neb. no. 119 U. S. no. 26	2/1/90	labeled only "n. var."
Siphonophora artemisicola	Cotype Neb. no. 126 U. S. no. 4	6/24/90	labeled only "n. sp."
Siphonophora chrysanthemicolens	Cotypes Neb. no. 131, 132 U. S. no. 7, 149		labeled only "n. sp."

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Species		Type or cotype	Exact date on label	Whether labeled as type or cotype
Siphonophora carnosa var. impatientis	Cotype	Neb. no. 127, 128, 129 U. S. no. 18	8/22/90	labeled only "n. var."
Siphonophora desmodii	Cotype	Neb. no. 133, 134, 135 U. S. no. 10, 11	7/29/90	labeled only "n. sp."
Siphonophora gaurae	Cotype	Neb. no. 140	9/4/90	labeled only "n. sp."
Siphonophora gaurina	Cotype	Neb. no. 141 U. S. no. 17, 397	9/0/90	labeled only "n. sp."
Siphonophora grindeliae	Cotype	Neb. no. 142 U. S. no. 396	5/8/89	labeled only "n. sp."
Siphonophora luteola	Type	U. S. no. 398		
Phorodon cynoglossi	Cotype	Neb. no. 157, 158, 159 U. S. 141, 142	1/5/91	labeled only "n. sp."
Phorodon monardae	Type	Neb. no. 160	5/24/90	labeled "n. sp."—"type"
Chryptosiphum canadensis	Cotype	Neb. no. 161, 162 U. S. no. 36, 37, 148	7/31/90	labeled only "n. sp."

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species, but these are not among the descriptions left by Williams in the thesis nor are there slides of the same, and consequently they will probably have to continue as *nomina nuda. Phorodon monardae* also is not included in the thesis but Williams has left a slide in the University of Nebraska Collection (no. 160) labeled "n. sp.," "type," from which a description can probably later be drawn. The remaining species mentioned in the "Host-Plant List" are represented by both descriptions and specimens except in the case of *Pemphigus walshii, Lachnus flocculosa* and *Siphonophora eupatorii,* of which species there are no specimens in the collection but of which there are full descriptions.

Family **APHIDIDAE**

Subfamily **CHERMESINAE**

Genus **Phylloxera**

1. **Phylloxera caryae-caulis** (Fitch).

Fitch, Ins. N. Y., I and II, p. 155 (1854). (*Pemphigus caryae-caulis.*)
Shimer, Trans. Am. Ent. Soc., II, p. 389, ibid., p. 391 (1869). (*Dactylosphaera subellipticum* and *D. caryae-magnum.*)
Riley, Ins. Mo., 7th Rep., p. 117 (1875). (*Phylloxera caryae-caulis.*)
Thomas, Ins. Ill., 8th Rep., p. 160 (1879).

Apterous oviparous female: Body distended with eggs. Broadly pear-shaped, rapidly narrowed behind. General color dirty white to yellowish green. Antennae brown; 3-jointed; III about two thirds the whole antennae; 0.40 mm. long. Beak brownish, 0.45 mm. long. Legs short, brown. Coxae brown. Body about 1.95 mm. long and 1.50 mm. wide.

The very young are uniformly whitish, becoming greenish yellow with age. The pupae are light yellowish green, with the head and thorax often slightly dusky. Eyes red. Antennae and legs dusky. About 1.00 mm. in length.

Winged form: General color light yellowish green; head and thorax brown to black. Eyes bright red. Antennae brownish, 0.25 mm. long; III about 0.16 mm. long, with a large tooth-like projection near the base, then becoming narrow and the end club-shaped. Legs dusky. Abdomen drawn out behind with a gradually narrowed outline. Beak about the length of the antennae, dusky especially toward the tip. Wings hyaline; stigma with both ends pointed, having the appearance of a thickened portion of the wing, opaque. Oblique veins dusky, robust, well defined throughout. Length of body 1.20–1.50 mm., to tip of wings 1.50–2.25 mm.

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depending on the age of the insect, being much greater when the abdomen is full of eggs.

On hickory (*Carya amara*), Wabash, June 1, 1889, when only the foundress of the colony and the very young larvae were found. On *C. porcina,* Ashland, May 24 and June 11, 1890. On the latter date plenty of winged forms were found in the galls which were breaking open at the apex to allow the lice to escape. The galls are rather large, more or less elongated masses on the young twigs, petioles, and the base of the midveins of the leaves. In some cases they assume a somewhat conical outline. The younger trees and shoots are most affected, often nearly the entire foliage being distorted by the galls.

Specimens in collection of the University of Nebraska (nos. 1, 2) and of the U. S. National Museum (no. 159).

2. **Phylloxera vastatrix** Planch.

On *Vitis cordifolia,* Fremont, July 31, 1890, specimen no. 3, University of Nebraska collection.

Genus **Pemphigus**

3. **Pemphigus alnifoliae** n. sp.

The young are light yellowish green, legs and antennae whitish. Pupae similarly colored.

Winged female: Head and thorax black. Head rather small. Antennae brownish black with white rings at each joint and sometimes V and VI are quite pale colored, III equals IV and V, IV, V and VI subequal, VI with its spur about two thirds III; IV, V and VI club-shaped, III cylindrical. Antennae on quite prominent, pale tubercles. Eyes black. Wings with yellow insertions and yellowish stigma, first and second discoidals starting from nearly the same place, slightly curved. Cubital moderately distinct for its whole length, starting from nearly the same place as the second discoidal. All of the discoidals as well as the stigmal vein with smoky borders. Abdomen light yellowish green. Legs dusky. Length of antennae 0.10 mm., length of body 3.54 mm.

Stem-mother: Dark green; head, antennae and some markings on thorax dusky. Abdomen swollen, ovate or oblong. Length of body 3.75 to 4.00 mm. All forms more or less covered with white flocculency.

On leaves of *Amelanchier alnifolia,* causing them to curl and form a pseudogall. War Bonnet Canyon, June 21, 1890.

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Cotypes in collection of the University of Nebraska (no. 4) and of the U. S. National Museum (no. 120).

4. **Pemphigus balsamiferae** n. sp.

Stem-mother: General color pale green; head, antennae and legs dusky black. Antennae 4-jointed, joint III longest, IV with very short claw. Abdomen swollen, broadly oval, generally pointed posteriorly, with six longitudinal rows of white spots (white flocculent when fresh) above, and a marginal row of small brownish spots.

Larva pale green. Pupa pale green with paler thorax, wing-pads, legs, and antennae; legs and antennae become darker with age.

Winged female: Head, legs, antennae and thorax brown to black; neck and abdomen green; joints I and II subequal, IV, V and VI club-shaped, III with 8–10 narrowly elongate transverse sensoria, IV with 3–4, V with 3, VI with none. Joints III–VI more or less annulate. Wings with heavy black costal and subcostal veins, first and second discoidals only moderately near at the base, third discoidal obsolete for about one third its length. Stigma dusky acute at inner end, outer end angled, stigmal vein curved slightly.

Squaw Creek, June 24, 1890. On *Populus balsamifera,* forming an irregular semiglobular or more or less elongated gall on the under side of the leaves, with an irregular opening on the upper side.

Cotypes in collection of the University of Nebraska (no. 5) and of the U. S. National Museum (no. 121).

5. **Pemphigus fraxinifolii** Riley.

Riley, Bull. U. S. Geol. Sur. Ter., Vol. VI, p. 17 (1879).
Thomas, Ins. Ill., 8th Rep., pp. 146, 210 (1879).
Oestlund, Syn. Aph. Minn., p. 23 (1887).

Winged female: Alar expanse 5.70 mm. Head and thorax dusky; abdomen dark green. Antennae reaching by the length of the apical joint beyond the costal base of front wings; inconspicuously annulated and with joints III to VI but moderately narrowed at base; III as long as IV and V together; VI (including unguis) nearly three fourths as long as V, with the unguis distinct and of normal length. Scutellar lobes of mesonotum broad and well marked. Legs normal. Wings hyaline; stigma linear, or not wider than subcostal space, yellowish and poorly defined anteriorly; veins very slender and subhyaline, the stigmal most distinct, starting a little in front of middle of stigma and but faintly curved; cubital almost invisible but not obsolete at base, where it nearly joins the

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second discoidal. Terminal space between the first and second discoidals and between the last and cubital subequal; that between cubital and stigmal only half as great. Discoidals of hind wings proceeding connectedly from subcostal. Promiscus reaching beyond front coxae; abdomen with 7 rather large round spots on each side, each sending out 2 hairs. (In some specimens the cubital starts independently from the subcostal; in others it joins the second discoidal a short distance from the base.) Pupa with third joint of antennae relatively somewhat shorter.

Larva of probable second generation: Antennae smooth, 4-jointed; III longer than IV and as long as I and II together; apical nipple one sixth as long as IV. Promiscus slender, reaching beyond hind coxae. Legs rather long and stout. Tibiae, tarsi and anal joints of abdomen with a few conspicuous hairs. Full grown apterous female, probably of same generation, differs in having 6-jointed antennae, proportioned much as in the winged female.

Larva from winged female (probably fourth generation): Antennae 5-jointed; I, II, III and IV subequal in length; III and IV stouter; V very short and rounded at tip. Promiscus very long, reaching beyond tip of abdomen.

Infesting the terminal leaves of ash (*Fraxinus americana* and *S. sambucifolia*) from spring till late summer, and producing a twisted curl thereof; the young lice varying in color from deep glaucous to livid, very flocculent and exuding the liquid globules quite copiously; winged females appearing early in June (Riley).

On ash (*Fraxinus americana*). Ashland, May 25, 1890. Lincoln, June 4, 1890, when the first winged females were found.

Specimens in collection of the University of Nebraska (nos. 6, 7) and of the U. S. National Museum (nos. 122, 123, 339).

6. **Pemphigus populicaulis** Fitch.

Fitch, Ins. N. Y., V, p. 845, par. 353 (1859).

Walsh, Proc. Ent. Soc. Phil., I, p. 305 (1862). *Byrsocrypta (pemphigus) populicaulis.*

Thomas, Ins. Ill., 8th Rep., p. 149 (1879). *Pemphigus populicaulis.*

LeBaron, Ins. Ill., 3d Rep., p. 193 (1873).

Oestlund, Syn. Aph. Minn., p. 21 (1887).

Stem-mother: Subglobose, pale yellowish. Antennae 4-jointed, brownish. Legs and coxae brown. Beak short, pale, brown tipped. Eyes imperfect, blackish.

Pupa pale yellowish. Eyes red. Legs, antennae and wing-pads whitish. Antennae 6-jointed, III longest.

Winged viviparous female: Head and thorax black. Eyes dark red.

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Antennae reaching to rear of thorax, I and II pale, rest dusky; III equaling IV and V together and rather longer than VI with its unguis, cylindrical; IV–VI club-shaped, III–VI irregularly and indistinctly annulate; VI with the contraction to the unguis abrupt. Wings delicate, the three discoidals arising almost from the same place, the third subobsolete at base. The apices of the first and second twice as far apart as those of the second and third. Stigma rather broad. Legs dusky. Abdomen yellowish green, pulverulent, the embryos showing very plainly. Length of body 2.15 mm., to tip of wings 3.25 mm.; alar expanse about 6.00 mm.

On cottonwood. Lincoln, Weeping Water, Ashland, Squaw Creek. One of our commonest aphids. It forms a gall at the base of the leaves by causing the petiole to become twisted. The winged insects escape through an oblique opening in the gall where the edges of the twisted petiole come together. Winged females are found in June.

Specimens in collection of the U. S. National Museum (no. 124).

7. **Pemphigus populi-monilis** Riley.

Riley, Bull. U. S. Geol. Sur. Ter., Vol. V, I, p. 13, pl. II, fig. 3 (1879).
Thomas, Ins. Ill., 8th Rep., p. 205, fig. 45 (1879).

Winged female: Average expanse 6.50 mm. Black, the abdomen a little lighter, especially at the tip, finely powdered with white; broad across the shoulders, the scutellar lobes of the mesonotum being rather more flattened than the praescutum; the head rather small and narrow. Antennae and legs rather short, the former reaching only to base of front wings; 6-jointed, I, II, IV and V subequal in length; III twice as long; VI not quite as long as III; I and II very stout; III, IV and V somewhat clavate, nearly smooth above, but with about 12 deep constrictions beneath. Legs normal, with basal joints of tarsus tolerably well separated and unguis stout. Wings subhyaline, front wings with stigma strongly angulate, dusky, the lower portion almost black. Veins dusky, the costal and subcostal stout and darkest. The stigmal vein undulate, starting from a little beyond the middle of the stigma. First and second discoidals almost connected at base (in three specimens entirely so) and the distance between them about one third greater than that between the second and third discoidals, and that between these two subequal with that between the last mentioned and stigmal; third discoidal obsolete at base, fold of hind border but moderately thick. Hind wings ample, hook-angle but moderate, the subcostal slightly undulate and considerably elbowed at basal third, whence spring the discoidals, the first bending slightly toward posterior margin, the second toward costal margin, the spaces between the tips of

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the costal and discoidals subequal and together rather more than half the posterior border. (An examination of fourteen specimens only showed one with third discoidal forked in both wings and another with the same vein forked on the left wing and second discoidal also forked near the tip.) When newly hatched in the first stage the basal joint of the tarsus is hardly perceptible and the tarsal hairs are simple. The antennae are 4-jointed, the basal joint half as long as the second, third and fourth, somewhat longer and subequal; fourth suddenly narrowed at tip; the promiscus reaches beyond the hind coxae. After the first molt the antennae are 5-jointed, IV very short and almost globular; the promiscus now reaches to middle coxae only. In the pupa stage the antennae are 6-jointed.

Young from winged female similar to the same stage of its parent, except in the promiscus reaching beyond anus. Length 0.15 mm.

Galls on the narrow-leaved cottonwood (*Populus angustifolia*). A series of more or less confluent moniliform swellings on the upper side of the leaf, each containing a single female, destined to become winged, when it escapes from beneath, the winged insect occupying the entire cavity of the gall. The galls are often so plentiful as to cover nearly every leaf of the tree, but other kinds, as *P. monilifera, P. tremuloides*, etc., are not injured, being entirely free from the galls of this louse. The galls when not very numerous appear most commonly on the terminal leaves of a twig. They form a confluent series of pale yellow ovoid swellings, on each side of the midrib, recalling in the distance a lot of unripe cherries, or, again, the galls produced on a true willow by the sawfly larva, *Nematus salicis-pomum* Walsh. There are sometimes three rows of these swellings, and they are not infrequently tinted red. There are, however, more often but two rows, occupying nearly the whole space each side of the midrib. The galls are formed by the folding under of the sides of the leaf and bulging of the same around the insect, which is always found solitary (Riley).

On narrow-leaved cottonwood (*Populus angustifolia*). Squaw Canyon, Sioux Co., June 24, 1890. Only the youngest leaves were affected, and only young, wingless lice were found. Professor Bruner found it quite plentiful in Idaho and Utah in the month of August; Colorado, July (Riley); Kansas (Monell).

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Specimens in collection of the University of Nebraska (no. 8) and of the U. S. National Museum (no. 125).

8. **Pemphigus populi-transversus** Riley.

Riley, Bull. U. S. Geol. Sur. Ter., Vol. V, I, p. 15, pl. fig. 5 (1879).
Thomas, Ins. Ill., 8th Rep., p. 208, fig. 47 (1879).
Oestlund, Syn. Aph. Minn., p. 21 (1887).

Winged female: Expanse 7 mm., pruinescent, with abdomen more yellowish, inclining to green. Antennae reaching a little beyond the base of front wings, smooth; III, IV and V cylindrical and of equal thickness; III as long as the other two together; VI more slender at base and with the apical unguis nearly as long as III. Thorax with mesonotal swellings small. Terminal distance between first and second discoidal veins nearly equal to that between this last and the stigmal vein; discoidals almost connected, cubital obsolete at base, subcostal heavy. Stigma scarcely wider than subcostal space, acuminate at tip and with the vein starting a little in front of its middle. Hind wings with the discoidals connected at base, where the subcostal is slightly produced. Legs normal. Abdomen showing about 30 pseudova and with 4 rows of faint piliferous dots on the dorsum.

Pupa with I, II, IV and V of antennae subequal in length. The wingless forms are pale creamy white, with faintly dusky members.

Gall formed upon the leaf of *Populus balsamifera.* An elongate oval swelling, causing the curving and broadening of the petiole, and opening on the opposite side by a transverse slit, with a whitish, slightly thickened and elevated margin, recalling human lips. By the latter part of June the stem-mother is surrounded with young of various sizes, all covered with the usual white secretion, and mixed with the liquid globules. Winged females produced in autumn, sometimes not till the leaves have fallen (Riley).

On cotton wood (*Populus monilifera*). Lincoln, October 13, 1888, when winged females were found; Weeping Water, during the summer and fall, 1888 to 1890; Ashland, June 20 and September 25, at which latter date winged females were found in the galls, evidently but lately transformed.

Specimens in collection of the U. S. National Museum (nos. 126, 128).

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9. **Pemphigus rhois** Fitch.

On *Rhus glabra,* West Point, July 29, 1890, specimen no. 9, University of Nebraska collection.

10. **Pemphigus tesselata** (Fitch).

Fitch, 4th Rep. St. Cab. Nat. Hist. (1851). *Eriosoma tesselata.*
Glover, U. S. Ag. Rep., p. 39 (1876).
Glover, Unpub. Pl. Hom., III, fig. 10, *imbricata.*
Thomas, Ins. Ill., 8th Rep., p. 139 (1879). *Schizoneura tesselata.*
Osborn, Can. Ent., XIV, p. 61 (1882). *Pemphigus tesselata.*

Apterous viviparous female: General color bluish black. Antennae 5-jointed, III longest, blackish brown, with whitish ring at the articulations, with a few very fine hairs, 0.80 mm. long. Head brownish, a broad blackish brown band extending along each side just at the base of the antennae and the eyes, which turns in at right angles and runs transversely across the base of the head, where it is divided by a narrow whitish line on each side of which is a small circular dot; pulverulent but not flocculent. Eyes small, black. Beak reaching to hind coxae. Legs short. Abdomen with segments distinctly separated, and with longitudinal striae forming square checker-like places on the dorsum. In each of these squares is a circular, pore-like spot from which proceed long shreds of flocculent matter, which cover the abdomen and extend out beyond the tip. Apex of abdomen hairy. Length of body 4 mm.

On the under side of the leaves of ash (*Fraxinus americanus*), causing the leaves to curl and become distorted. Ashland, May 15, 1890.

I was obliged to leave the vicinity before the winged form appeared, so did not procure any of them. The following description is taken from Professor Osborn's paper on this species in Can. Ent., XIV, p. 62: "Fresh specimens of winged females cleaned in alcohol are described in Ms. by Dr. Hagen as 'Head and antennae black, prothorax pale dirty whitish; thorax chestnut brown; abdomen pale whitish gray, above with six rows of blackish spots; beneath with four blackish fine lines near the middle, not reaching the tip; legs brown, tibiae and tarsi paler; wings opaque, veins pale, except the mediana of the fore wings, which is brown. Full grown nympha is similar to the imago; the wing coverings are black.'

"'Alcoholic specimens of winged viviparous female were dark bluish black with the white filaments on the abdomen less promi-

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nent than in the apterous female; head and thorax covered with whitish powder. The antennae are 6-jointed by the division of the third(?) larval joint into *three,* the second joint shortening; III to VI are marked with transverse irregular interruptions lined with a thin membrane, while the terminal and subterminal joints contain sensitive glands, as do also these joints in the larva and apterous female. Length 4 to 5 mm. Expanse 10 to 12 mm.'"

All the forms of *Pem. fraxinifolii* Riley were found on the same trees and at the same time but these differ very materially from the above.

11. **Pemphigus vagabundus** (Walsh).

Walsh, Proc. Ent. Soc. Phil., I, p. 306 (1862). *Byrsocrypta vagabunda.*
Packard, Guide to Study of Ins., p. 524, 2d Ed. (1870). *Pemphigus vagabundus.*
Thomas, Ins. Ill., 8th Rep., p. 151 (1879).
Oestlund, Syn. Aph. Minn., p. 22 (1887).

Stem-mother: Very large, subglobose, pale yellowish green. Head brownish. Antennae 4-jointed; III very long, IV with an unguis nearly as long as the remainder of the joint; I, II and III pale, IV dusky. Eyes imperfect but quite distinct and black. Beak reaching to middle coxae, black tipped. Legs short, pale, with brownish joints and tarsi. Coxae brown. Length of body 5.10 mm., width 4.25 mm.

Pupa greenish yellow. Antennae 6-jointed; VI with unguis longer than III. Legs, wing-pads and antennae pale, tips of antennae and tarsi dusky.

Winged viviparous female: Head and thorax shining black. Eyes dark red. Antennae reaching to rear of thorax, black, with paler articulations; III with 8–10 transverse sensoria, as long as IV, V and VI without the unguis and about as long as VI with its unguis; IV, V and lower part of VI subequal; unguis of VI twice as long as the lower part; III cylindrical; IV, V and lower part of VI club-shaped. Wings delicate; subcostal and stigma conspicuous, yellowish brown, the latter rather short; oblique veins very slender, hardly perceptible. Abdomen greenish, showing the embryos very plainly. Legs blackish. Beneath the fore part of the body is dusky, the mesosternum black and the abdomen pale yellowish green. Length of body 2.70 mm., to tip of wings 4 mm.; alar expanse 7.50 mm.

Forming a large irregular gall at the ends of twigs of cottonwood (*Populus monilifera*) and balsam poplar (*Populus balsamifera*). Weeping Water, Lincoln, Squaw Canyon, Ashland. The past season galls were found June 13 containing stem-mother

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and pupae, and from these winged females were bred June 17. My observations coincide with those of Oestlund, that the galls are deserted by the insects during July and August. I have been able to find the galls occupied in the latter month a few times; generally they are empty by the last of July. Some of the trees in Lincoln and Ashland are so badly infested with these insects that the large blackish galls render them very unsightly. The insects seem to affect the same trees year after year.

Specimens in collection of the University of Nebraska (nos. 10, 11) and of the U. S. National Museum (no. 129).

12. **Pemphigus walshii** n. sp.

Stem-mother: Globose, yellowish white. Head with top and front black, below pale. Beak reaching almost to second coxae. Antennae blackish, 4-jointed; I and II short and thick, III longest, cylindrical; IV half as long as III, slender, cylindrical. Legs brown. Length of body 1.45 mm., width 1.07 mm., length of antennae 2 mm. Young stem-mother yellowish white, antennae indistinctly 6-jointed. Beak reaching to or beyond hind coxae. Tarsi 2-jointed. Abdomen covered more or less with flocculent matter which is generally arranged in longitudinal rows of flocculent spots on the dorsum. Honey tubes appearing as circular openings.

Winged form: Black. Head and thorax shining. Antennae black, reaching beyond the tip of the thorax; III–VI conspicuously annulate, III with 21–25 rings, IV with 5–7, V with 8 and VI with 80 and a short claw bearing on its tip 3 short, bristle-like hairs; I short and inconspicuous, II short but broad, appearing almost spherical, III–IV cylindrical with rather small articulations; III 0.2 mm. long, II 0.08 mm., V 0.80 mm., VI, including claw, 0.12 mm. Wings large, roughened with minute scales; veins slender, brown, first to second discoids originating near each other, the first somewhat sinuate, the second straight till near the margin of the wing when it curves gradually toward the body; third discoid very slender, the basal third obsolete (many specimens show a small bunch near the margin of the wing). Subcostal heavy, smoky-bordered on its front margin. Stigma whitish with a smoky, black posterior margin caused by the continuation of the subcostal. Stigmal vein rather obtuse curved at the basal third, then straight and the apical third recurved. Hind wings with slender light brown veins. Two anterior pair of legs dark brown to black with tibia and bases of femora paler, posterior pair all black; rather small and slender. Tarsi distinctly 2-jointed and with long, slender claws. Abdomen blackish pulverulent. Length of body 1 mm., to tip of wings 2 mm.

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Forming a club-shaped pedunculated gall on the upper side of leaves of white elm (*Ulmus americana*).

The gall is from one half to one inch long and while growing has much the appearance of the gall made by *Tetraneura ulmi* of Europe. The stem-mother and wingless young were found at Ashland, June 11, 1890, and the fully developed winged form was collected at Lincoln (Dinges) June 29, 1889.

No specimens in either collection.

Subfamily **SCHIZONEURINAE**

Genus **Schizoneura**

13. **Schizoneura americana** Riley.

Riley, Bull. U. S. Geol. Sur. Ter., Vol. V, No. 1, p. 4, pl. I, fig. 1 (a to h) (1879).

Thomas, Ins. Ill., 8th Rep., p. 202, fig. 44 (1879).

Oestlund, Syn. Aph. Minn., p. 27 (1887).

"Impregnated egg: 0.50 mm. long, gamboge-yellow, inclining to brown in color, with no especial external sculpture.

"First generation: Stem-mother pale yellowish red, with black members when first hatched, the red deepening and becoming purplish or livid with age. When mature, averaging 3.50 mm. in length, globose or pyriform, with subobsolete honey tubes and six dorsal rows of darker piliferous and tuberculous spots. Antennae 5-jointed, with III more than equaling IV and V together in length.

"Second generation: Differing in no essential respect from the preceding, except that the individuals do not attain so great a size. Bright brownish red when born, they soon become livid brown.

"Third generation: Mature winged female, alar expanse 5 to 5.60 mm. Body dusky, the abdomen slightly reddish; legs either dusky or yellowish red. Antennae as long as head and thorax together, dusky, rarely yellowish, not pilose, but with a few short setous points; 6-jointed, I and II slightly bulbous; III either surpassing or equaling in length IV, V and VI together, which are subequal; the terminal joint usually shortest, the apical subjoint being normal, and in some cases sufficiently constricted to resemble an additional joint; III, IV and V rather distinctly annulated, the constrictions being generally quite deep and producing a moniliform aspect, there being on an average 22 such on III. Tarsi with basal joint distinctly separated into a lobe, the claws strong and in length twice the diameter of the tarsus. Wings hyaline; front pair with veins becoming obsolete at tips; stigma subhyaline, either of a yellowish tinge or somewhat dusky; stigmal vein starting from the middle of the stigma, and

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normally curved; cubital vein obsolete for nearly one third its length, the furcal forming with it almost a point; the terminal distance between first and second discoidals equal to about five times that between their bases (often rather more); terminal distance between furcal and cubital and cubital and second discoidal veins subequal, that between stigmal and furcal slightly shorter, that between second and first discoidals one third greater, and about equal that between stigmal and stigma. Hind wings with the subcostal almost straight, there being a curve where it gives off the discoidal veins, which are obsolete at their extreme base and not confluent with it. (The wing venation is very constant. Out of nearly 100 specimens examined, I have found only an unusual shortening of the cubital in two individuals.) The larva and pupa in this third generation differ from the winged insect in being more reddish and having the antennae ringed with less distinct constrictions, in the legs being paler, in the claws being stronger and in the basal joint of the tarsus being more connate with the terminal joint. They have a distinct annulated elevation at each side posteriorly—a sort of pseudo-honey tube. When first born, they are of a dull yellow, and the antennal joints are more than equal in length.

"Fourth generation: That from the first winged females: Differs from the preceding in the promiscus being much longer, in the antennae having but five joints, the third being somewhat longest and the first the shortest, but all often being much more nearly equal in length, with no annulated constrictions. The color is more decidedly orange. When newly hatched, the thickened end of the promiscus often extends half the length of the body beyond the anus. The legs are long and stout, and the basal joint of the tarsus is distinct, but not separated. The capitate hairs are obsolete. It is born with an enveloping pellicle or pseudovum, and though of a bright red with pale legs at first, soon becomes brownish, with dark members.

"Fifth generation: The counterpart of the second.

"Sixth generation: Second winged: Resembles the third, but usually rather lighter colored, with the wing-veins, the spinous armature of surfaces and the constrictions of the antennae less strong, and with the third joint of antennae rather less in length than the terminal three together.

"Seventh generation: True sexual individuals: Born within an egg-like pellicle. With stout promiscus reaching beyond the middle coxae; the antennae 5-jointed, with the joints subequal. Bark-feeding. Orange in color. Undergoing one molt and then being at once distinguished from the other forms by the brighter orange yellow color, the rudimentary mouth, the more simple eyes (composed of three facets), by the shorter 5-jointed antennae, the joints subequal in length; by the shorter legs, with smaller claws to the tarsi, and more distinct terminal capitate hairs, or pulvilli. The skin is transparent, the body filled more or less with fatty globules. The female is nearly pyriform, and averages 0.40 mm. in length.

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A single egg is visible through the translucent skin, and, according to age, occupies more or less of the whole of the body. The male is narrower and smaller, the penis being bulbous, with a couple of spine-like genital clasps" (Riley).

On leaves of white elm (*Ulmus americana*) curling them into a pseudogall. In the spring generally only the side of the leaf is curled up, but later in the season, especially if the insects are plentiful, all parts of the leaf may be twisted out of shape. The stem-mother always settles upon the under side of the leaf.

These insects hatch out almost as soon as the leaves appear in the spring and do much damage to the trees, especially in cities. Frequently nearly every leaf on a tree will be the abode of one or more colonies of this pest. Found during spring and summer at Ashland, Lincoln, Weeping Water and many other parts of the state, 1888–90.

Specimens in collection of the University of Nebraska (nos. 12, 13, 14, 15) and of the U. S. National Museum (nos. 68, 69, 70).

14. **Schizoneura corni** (Fabricius).

Fabricius, Ent. Syst., IV, p. 214, No. 19 (1794). *Aphis corni.*
Schrank, Fn. Boi., II, p. 108 (1801). *Aphis corni.*
Kaltenbach, Mon. Pflan., p. 168 (1843). *Schizoneura corni.*
Koch, Die Pflan., p. 268, fig. 343 (1854). *Schizoneura vagans.*
Koch, *l. c.*, p. 275, figs. 348, 349. *Aniscia corni.*
Passerini, Gli afidi, p. 38 (1860). *Schizoneura venusta.*
Walsh, Proc. Ent. Soc. Phil., I, p. 304 (1862). *Eriosoma? fungicola.*
Walsh, *l. c. E. cornicola.*
Thomas, Ins. Ill., 8th Rep., p. 138 (1879). *Schizoneura panicola.*
Thomas, *l. c. S. fungicola* and *S. cornicola.*
Buckton, Mon. Brit. Aph., III, p. 107, pl. CX, figs. 1 to 4 (1881). *Schizoneura corni.*
Weed, Psyche, V, p. 129 (1887). *Schizoneura cornicola?*
Osborn, Bull. 22, U. S. Ent. Div., p. 32 (1890). *Schizoneura corni.*

"Winged viviparous female (pseudogyna pupifera): Expanse of wings, 6 mm.; length of body, 2 mm.; width of body, 0.80 mm.; length of antennae, 0.90 mm. Black above, except anterior and lateral margins of abdomen, and in many specimens more or less of posterior portion. Beneath black, except prothorax and abdomen (save a black patch in front of anus), which are dull whitish brown. Beak black, except a more or less lighter patch near the base, hairy, reaching posterior coxae. Legs robust, black, except a brownish space at base of anterior femora; thickly

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provided with brown hairs. Antennae robust, beset with brown hairs. Joints I and II short, smooth; III long, with row of tubercles on its outer ventro-lateral surface; IV and V subequal, with tubercles as on three; VI a little longer than V, excavated on its outer lateral surface about two thirds distance from base. Wing veins mostly brown. Stigma brownish with anterior portion darker."

The form found on grass roots differs from this in being lighter colored generally, and in having fewer sensoria on the antennae. This is due to the habitat and to the fact that the root form is not so well developed. I think that there can be no doubt that these two belong to the same species. I find on referring to my notes, that I had noticed the resemblance and could get no satisfactory difference between them before the excellent article by Professor Osborn came out. I have found many individuals on *Cornus* that were lighter colored than those on roots of grass; and have also found the number of sensoria to be quite variable.

Found during the summers of 1888 to 1890, on *Cornus stolonifera, C. asperifolia, C. paniculata,* generally on the under side of the leaves, but frequently so plentiful as to almost completely cover the tree.

The root form is found on *Panicum glabrum, P. crus-galli, P. capillare, Setaria glauca, S. viridis, S. italica, Eragrostis major, Polygonum persicaria, P. pennsylvanicum,* and a number of other garden weeds in the eastern part of the state.

What goes before is found in Bulletin 22, U. S. Ent. Div., in Weed's description from Psyche, V, 129.

Specimens of root form in collection of the University of Nebraska (no. 16).

15. **Schizoneura crataegi** Oestlund.

Oestlund, Syn. Aph. Minn., p. 27 (1887).

Apterous form: General color pale greenish. Eyes very small and imperfect, black. Beak reaching beyond hind coxae. Antennae pale, 6-jointed; I and II small and bead-like, III equal to IV, V and VI together. Legs pale. Honey tubes represented by circular openings, along the edges of which are black lines. Very thickly covered over with white flocculency. The stem-mother is dusky brown, with more or less of a reddish tinge, and has dusky limbs.

Winged form: Head and thorax shining black; abdomen dusky to black-

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ish. Antennae similar to those of *Schizoneura americana;* III longer than IV, V and VI together. Beak reaching hind coxae or abdomen. Wings hyaline, with slender veins; cubital of fore wings distinct for its entire length, though often very slender, branching about midway. In other respects the wings are similar to *Sch. americana.* Legs and tarsi somewhat shorter. Honey tubes are circular openings but slightly raised above the surface of the abdomen. Not flocculent as in apterous but only pulverulent. Expanse of wings 6 mm.

Found on the under side of twigs and young branches of hawthorn (*Crataegus tomentosa* and *C. punctata*). West Point, July 29, 1890. As only one winged specimen was found and that in a bad condition for description I give Oestlund's description of that form.

Specimens in collection of the University of Nebraska (no. 17) and of the U. S. National Museum (no. 72).

16. **Schizoneura lanigera** Hausman.

Specimens from roots of apple in collection of the University of Nebraska (nos. 18, 19).

17. **Schizoneura rileyi** Thomas.

Riley, Ins. Mo., 1st Rep., p. 123 (1868). *Eriosoma ulmi.*
Thomas, Ins. Ill., 8th Rep., p. 136 (1879). *Schizoneura rileyi.*
Riley, Gen'l Ind. Supp. Mo. Rep., p. 87 (1881). *Schizoneura rileyi.*

Stem-mother: Subglobose, rather large, pale green to reddish yellow. Antennae 5-jointed, dusky brown. Legs and coxae brown. Head and anal plates blackish brown. Beak reaching middle coxae, brownish. Eyes small, but distinct, black. Length of body 3 mm., width 2.05 mm.

Pupa varying from pale pinkish to purplish brown. Legs and antennae concolorous. Eyes pale to dark red.

Winged viviparous female: Color light brown to dark purplish brown. Head and thorax darker. Eyes dark red to almost black. Antennae and legs concolorus with body. Antennae 6-jointed, with III longer than any two of the remaining joints taken together, cylindrical; IV, V and VI club-shaped, subequal, or VI the shortest; not annulated as in *Sch. americana.* Wings with heavy blackish subcostal; oblique veins slender, brownish to black; cubital distinct for its entire length and with a fork about one third as long as the vein itself, which curves in an opposite direction to the stigmal vein. Stigma short and broad, dusky with posterior margin blackish. Length of body 2–2.10 mm., to tip of wings 2.50–2.75 mm.

On small branch of elm (*Ulmus americana*), causing an elongated swelling. Ashland, September, 1889. On the same kind

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of a tree at Lincoln, June, 1890, where it worked on both branches and leaves. It causes a curling of the leaves similar to *S. americana,* but the galls can be readily distinguished as those of this species are much more tightly curled than are those of *S. Americana.* This latter species is often to be found on the same tree. They can be easily separated, as they differ in size, antennae, venation and other minor points. My specimens differ somewhat from Dr. Riley's description, but I think that this is his species. It was very plentiful on the elms of Lincoln the past season, and could be seen in every crack in the bark of some trees. As they are always covered with a coat of flocculent matter the trees are rendered very unsightly.

Specimens in collection of the University of Nebraska (no. 20) and of the U. S. National Museum (no. 74).

Genus **Colopha**

18. **Colopha ulmicola** Fitch.

Ashland, June 11, 1890, on *Ulmus americana,* specimens no. 20a and 20b, University of Nebraska collection.

Subfamily **LACHNINAE**

Genus **Lachnus**

19. **Lachnus dentatus** LeBaron.

LeBaron, Ins. Ill., 3d Rep., p. 138 (1872).
Thomas, Ins. Ill., 8th Rep., p. 116 (1879).
Weed, Bull. O. Ag. Exp. Sta., Tech. Ser., Vol. I, No. 2, p. 117, pl. VII, fig. 1 (a and b).

"*Apterous viviparous female:* Body broadly ovate, covered with a dense fine pubescence. Color of body dark ashy gray, lighter posteriorly; antennae, legs (except basal two thirds of femora and ring at base of tibiae, which are reddish brown), tubercular cornicles, tubercle on middle of abdomen, beak and six transverse rows of six small circular spots on dorsum of abdomen, the two middle spots being about half as large as those at the sides, black. On the dorsum of the abdomen, slightly back of the middle and coinciding with the position of the two middle dots of the fourth row of spots is a prominent conical tubercle. Honey tubes reduced to flattened tubercles. Head large, subquadrate. Beak reaching to first abdominal segment. Antennae short, little more than twice as long as the head; III long. Length of body 5 mm.

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Winged male: Body black, with a grayish pile which on the abdomen gives it a distinct gray color; abdomen with transverse rows of black dots; honey tubes black as is also the prominent conical tooth on the middle of the abdomen; antennae piceous throughout, except in some cases in which the third joint is brown; legs piceous, except proximal half of femora and in some cases more or less of the proximal portion of the tibiae, which are reddish brown; beak black, except at base where it is brownish; wing insertions and sides of mesothorax yellowish or reddish brown; wings subhyaline, costal vein and stigma piceous, remaining veins brown. Antennae short, stout, provided with numerous spinose hairs and ventral surface of III to VI tuberculate, III long, equal to IV plus V; IV short, one third shorter than V, which is slightly longer than VI, the latter being distinctly swollen in the middle. Length of body 5 mm., to tip of wings 9 mm." (Weed).

On bark of young shoots and branches of willows (*Salix* sp.). Lincoln, November 1, 1888; Ashland, October 10, 1890.

Specimens in collection of the University of Nebraska (nos. 21, 22, 23) and of the U. S. National Museum (no. 76).

20. **Lachnus flocculosa** n. sp.

Apterous viviparous female: Head brown. Antennae pale brown or in young specimens more or less yellowish; almost or quite half as long as the body; I and II subequal, III longer than IV plus V, these latter subequal; VI with its short pointed spur only about three fourths V; III and IV cylindrical, V and VI somewhat club-shaped; whole of antennae covered with long, spreading, bristle-like hairs. Eyes dark red. Beak reaching behind the hind coxae, black tipped. Legs pilose with dorsal ends of femora and tibiae and tarsi brown to black; hind pair of legs generally darker and equaling the body in length. The second joint of the tarsi very long. Abdomen greenish or reddish brown, oval, with a marginal row of impressed blackish dots. Honey tubes with a broad conical base and flaring mouth; concolorous with the abdomen and with only rim dusky or becoming dusky towards the apex. Anal plates brown. Whole insect hairy and very thickly covered with flocculent matter. Length of body 1.90 to 2 mm.; antennae 0.95 mm.

Pupa: Very similar to the preceding but with the body generally more green colored and paler. Wing-pads dusky to almost black.

Winged female: Not found.

No specimens in either collection.

21. **Lachnus ponderosa** n. sp.

Apterous viviparous female: Large, brownish, pulverulent. The thoracic segments and the first abdominal segment marked with large dark brown

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spots. Antennae hardly one third the body in length; two basal joints, dusky; III, IV and V yellowish white, with dusky to black tips; VI short, thick and bead-like, black; claw short, the transition scarcely distinguishable. Eyes dark red. Legs with bases of femora and a broad ring on each tibia, yellowish white, rest black; hind legs long, the rest moderately so. Beak very long, reaching almost to the tip of the abdomen in some specimens. Abdomen with blackish brown marginal spots, three rows of impressed black dots on each side and a larger double row on the median line, the two posterior pairs of which run together, forming two larger transversely elongated spots behind the honey tubes. Honey tubes conspicuous, dark brown, broadly conical, with a thickened rim. Length of body about 4 mm., of beak about 2.40 mm. The body somewhat hairy; legs, antennae and apex of abdomen especially so. Tail very broadly conical, brown.

Winged viviparous female: Head and thorax black. Prothorax brownish. Antennae hardly reaching the posterior margin of the thorax, the two basal joints dark brown with whitish ring at apex; VI black, the rest with the larger basal portion and the tips yellowish white; III somewhat longer than IV and V taken together; V longer than IV; all the joints covered with slight raised places from which proceed long hairs. Eyes dark red. Beak reaching to or often beyond the middle of the abdomen, black pointed. Legs much as in apterous form, except that the front femora are nearly or quite black and the rest of the legs have generally much more black (sometimes the front tibiae are all black). Wings delicate, pointed, hardly as long as is common in this genus, costal and subcostal heavy, dark brown; discoidals slender, the cubital being at times almost subobsolete. Stigma long, brown, shape typical of the genus. Stigmal vein almost straight. Abdomen with two brown spots at the base, one on each side of the median line; paler than in the apterous form, many of the brown markings being represented only by a brownish stain; impressed dots and honey tubes as in the apterous form, the segment preceding the tail with a transverse row of five bristles arising from spots each side of the median line and the preceding segment with smaller bristles similarly placed. Tail short, broad and rounded, bordered with brown. Apical segment and anal plates dark brown, the former hairy. Each side of abdomen with a row of about 7 small tubercles. Length of body about 4.05 mm., to tip of wings about 5.15 mm.

Winged male: Similar to the above in color and markings, the abdominal markings rather paler. The wings are more slender and pointed. Beak reaching beyond the tip of the abdomen, with a long, acute black tip. Length of body 2.70 mm., to tip of wings 5 mm., beak 2.60 mm.

The abdomen and thorax in all forms is marked with large marginal and dorsal blotches of white pulverulence. This together with the banded legs gives the insect a very pretty variegated appearance.

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Found on *Pinus ponderosa* var. *scopulorum*. The apterous form was found by Professor Bruner at Belmont in July, 1889. On June 18, 1890, it was collected in both forms at the same place; and a few days later was found in great numbers at War Bonnet Canyon. It is one of the finest aphids that I have ever seen; its general appearance readily distinguishing it from any other species of the genus.

Cotypes in collection of the University of Nebraska (no. 24) and of the U. S. National Museum (no. 78).

22. **Lachnus rileyi** n. sp.

Apterous form: General color light olive brown, more or less pruinose; fusiform; head rather broad; eyes red; antennae over half the body in length, yellowish brown, dark at tips; legs generally darker than body, covered with bristly black hairs; honey tubes represented by a blackish ring. Whole body covered with long black bristly hairs.

Winged form: General color olive brown; pruinose; head broad, dark, with a central black stripe. Antennae blackish brown; III longest, its base pale. Eyes red. Thorax blackish. Legs black, with bases of femora and the upper half of the tibiae yellow; hind legs very long; all of tarsi very distinctly 2-jointed. Wings finely punctured; first and second branches coming out close together; cubitus obsolete at base, generally with only one branch (a few specimens show two branches); all the oblique veins very slender and delicate; costal and subcostal prominent; stigma very long, lanceolate, dusky; stigmal vein nearly straight. Honey tubes as in apterous form. Entire body hairy.

On *Pinus sylvestris* and *P. strobus*, growing on the university campus, October 4, 1888.

Joints III, IV, V are irregularly covered with numerous sensoria. This species has a few points in common with *Schizoneura pinicola* Thomas. The one branched cubitus shows the connection between *Schizoneura* and *Lachnus* already noticed by Kaltenbach, Thomas, Fitch and others. I think, however, that this irregularity in venation does not keep it from *Lachnus*. All the other characters belong to that genus.

Type in collection of the U. S. National Museum (no. 79).

23. **Lachnus? smilacis** n. sp.

Apterous viviparous female: On account of the dense pulverulence with which the insect is covered, it has a bluish gray appearance; when this is

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removed the insect is dark olive green. Antennae and legs reddish, the former but little more than one third as long as the body, on inconspicuous tubercles; II longer and more slender than I; III, IV, V and VI subequal in length; III thickest, the rest becoming successively slenderer; VI wtih a very short claw; III and VI subcylindrical, IV and V rather club-shaped. Head small. Eyes small, black. Beak pale, reaching to or beyond the hind coxae. Abdomen large and swollen, somewhat wrinkled. Honey tubes tubercle-like, inconspicuous, black, scarcely noticeable in the maturer individuals but easily seen in younger ones. Tail wanting. Legs short, the hind pair not reaching the tip of the abdomen in the larger specimens; hairy. Tarsi concolorous with legs, long, 2-jointed, with long claws. The very small head and thorax and the very large abdomen gives the insect a very characteristic balloon-shaped appearance. Antennae with only a few scattered, short, bristle-like hairs, generally two or three being at the apical end of each joint. Body without hairs of any kind except the apex of the abdomen which has a few bristle-like hairs. Length of body about 5 mm., width about 2.75 mm., antennae 1.90 mm., beak 1.20 mm.

In very young individuals the body is somewhat angled, the antennae 5-jointed and the beak reaches beyond the tip of the abdomen. The legs are very long and the eyes somewhat rudimentary.

This is only referred to this genus provisionally. The legs, eyes and general appearance are quite different from typical members of the genus; but the beak, tarsi, honey tubes and antennae are similar to those of *Lachnus*. The winged form, if there is one, is necessary for a correct location of the species. It will probably be found to belong to a new genus.

On stem, leaf-stalks and leaves of *Smilax herbaceae*. Fremont, July 31, 1890.

Type in the collection of U. S. National Museum (no. 77). [This species is *Pemphigus attenuatus* Osborn-Sirrinne.]

Subfamily **APHIDINAE**

Tribe **CALLIPTERINI**

Genus **Chaitophorus**

24. **Chaitophorus bruneri** n. sp.

Apterous viviparous female: Very dark green, almost black. Antennae not half the body in length, two basal and three apical joints dusky to black, rest pale. Head dark green. Thorax pale with darker bands. Abdomen with alternate dark and light transverse bands on the front part, then one broad dark green band covering two thirds of its dorsal surface

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and some paler markings at the tip. Honey tubes very pale green, longer than broad. Tail dark, short and broad. Entire body hairy but the hairs are thinner and shorter than in most species of this genus.

Winged viviparous female: General color of a lighter green than the apterous form. Antennae as in that form but darker. Head black. Eyes dark red. Neck green. Prothorax brownish. Thorax dark brown to black. Wings with yellowish insertions and heavy smoky black bands running along all the veins. Stigma short, broad and brown. Hind wings with only faint brown margins to the veins. Front pair of legs dusky, second and third pairs black with base of femora pale. Abdomen green, with an outer marginal row of small brown dots and these followed by a row of larger brown spots, and transverse bands of brown on each segment. Honey tubes pale yellowish green, as long again as broad. Tail short, conical, hairy and dark brown. Length of body 2.55 mm., to tip of wings 3.95 to 4 mm.

This species is by far the largest I have ever seen, belonging to this genus. In coloration it is similar to *Chaitophorus populicola* Thomas, but differs in many points, besides being a much larger species. Found on leaves of *Populus tremuloides,* War Bonnet Canyon, June 21, 1890. Named for Professor Lawrence Bruner in recognition of the aid he has rendered in the preparation of this work.

Cotypes in the collection of the University of Nebraska (no. 25) and of the U. S. National Museum (no. 38).

25. **Chaitophorus cordatae** n. sp.

Apterous form: Green, legs and antennae yellowish green, tarsi and tips of antennae dusky. The maturer forms have more or less of dark green spots on the abdomen, which are sometimes arranged in two longitudinal stripes. In a few individuals the dark green spots are replaced by brown ones. The whole insect is covered with long white hairs.

Winged form: Antennae about one half the body in length; I brownish; II, III and sometimes IV yellowish, remainder brown to black; III equals IV and V, IV and V are subequal, VI is one half V and about one third VII. Head dark brown, front rounded, hairy. Eyes red. Neck greenish yellow. Prothorax dark brown, with curved margins and much narrowed in front. Thorax dark brown with yellowish margins, making it appear as though marked by a broad longitudinal band nearly as broad as the prothorax. Wings with yellowish insertions, slender, with rather conspicuous brownish veins. Stigma very prominent, dusky, broad. Stigmal vein curved gradually for its entire length. Beak short. Abdomen greenish, with marginal spots and transverse bands of brown on each segment.

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Honey tubes conspicuous, brown. Tail short, brown margined. Abdomen with rather broad, brownish tip. Front pair of legs all yellowish; second and third pairs with dusky femora and yellowish tibiae. All with dusky tarsi. Length of body about 1.90 mm., to tip of wings 2.75 mm.

Very close to *Chaitophorus populi* (Linn.) and *C. populifoliae* (Fitch), but differing in coloration, size, markings and color of honey tubes, as well as feeding on a different plant.

On leaves and young branches of *Salix cordata,* Squaw Canyon, June 24, 1890.

Type in the collection of the U. S. National Museum (no. 39).

26. **Chaitophorus nigrae** Oestlund.

Oestlund, List Aph. Minn., p. 49 (1886).
Oestlund, Syn. Aph. Minn., p. 40 (1887).

Apterous form: General color dull blackish brown. Body flat, ovate, covered with long white hairs, dorsum more or less tuberculate, especially when the lice are young. Antennae rather more than half as long as the body, with pale base and growing darker towards the tip, hairy. More or less yellowish along the sides of the abdomen.

Winged form: Head and thorax black. Antennae almost as long as body, hairy, black, with base of III paler; III longest. Beak hardly reaching middle coxae. Wings with slender blackish brown veins; stigma short and broad, dusky brown. Legs with distal half of femora and tarsi blackish, rest pale. Abdomen very dark green to black. Honey tubes about as long as broad, paler than abdomen. Tail short, knobbed. Length of body 1.50 mm., to tip of wings 2.50 mm.

Found on leaves and young shoots of willow (*Salix nigra* and *S. longifolia*). Lincoln, October, 1888. A further study of this species will probably result in showing that it is but a variety of *C. viminalis* Monell.

Specimens in collection of the University of Nebraska (no. 26) and of the U. S. National Museum (no. 41).

27. **Chaitophorus populicola** Thomas.

On *Populus monilifera,* Lincoln, July 11, 1890, specimens in the collection of the University of Nebraska (nos. 27–32).

28. **Chaitophorus salicti** (Schrank).

Schrank, Fn. Boi., II, p. 103 (1801). *Aphis salicti.*
Kaltenbach, Mon. Pflan., p. 121 (1843). *Aphis salicti.*
Passerini, Gli afidi, p. 32 (1860). *Chaitophorus salicti.*

Apterous viviparous female: Long oval. Color yellowish green, with

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darker green markings, these often running together, giving the insect a dark green color. Head and spot on each side of the prothoracic segment brown. There is generally a yellow median stripe running the entire length of the body; on each side of this line are three rows of small brown tubercles, and on the margin of the abdomen is one or more rows of larger brown tubercles with one to several hairs proceeding from each, and sometimes there is a marginal row of brown spots along with the tubercles. Antennae about half as long as body, dusky, VII longer than III. Legs short, hairy, dusky yellow. Honey tubes very short, hardly raised above the surface of the abdomen, brown. Tail not noticeable. Length of body 1.80 mm.

Apterous oviparous female: Ovate, dark brownish green; a yellow median line and some yellowish markings between the segment bands, especially on the thorax and behind the honey tubes. Dorsum tuberculate, hairy. Eyes very dark red. Legs and antennae as in viviparous female, but darker colored generally. Honey tubes short, brown, with a yellow ring around the base on the abdomen. Tail short, yellow, knobbed. Length of body 1.50 mm.

Winged male: Head and thorax shining black. Antennae almost as long as the body; pale at base, dusky to black toward tip. Beak not reaching middle coxae. Front pair of legs yellowish with femoral tips and tarsi dusky; middle pair with more duskiness; hind pair with femora blackish, tibiae all yellow but tip; tarsi dusky. Wings with yellowish insertions, subcostal and stigma, and prominent, blackish oblique veins. Abdomen greenish yellow, with a central longitudinal band of greenish brown, widening behind (it is formed by short transverse bands on each segment which run together more or less) and numerous small dots on each side of this; sometimes darker marginal spots can be seen, but these are variable. Honey tubes longer and paler than in the other forms. Tail as in oviparous female. Length of body 1.80 mm., to tip of wings 3.15 mm.

On willow (*Salix* sp.). Ashland, October 10, 1890. The winged viviparous female was not found, but Kaltenbach describes it as being similar to my winged male.

Specimens in collection of the University of Nebraska (nos. 33, 34) and of the U. S. National Museum (no. 47).

29. **Chaitophorus spinosus** Oestlund.

Oestlund, List Aph. Minn., p. 49 (1886).

Oestlund, Syn. Aph. Minn., p. 38 (1887).

Apterous viviparous female: Greenish yellow, with a large dorsal spot of dark green, which is often more or less broken up into transverse bands. Whole dorsum covered with black spine-like hairs proceeding from tuber-

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cles. These hairs are most numerous along the middle of the abdomen, where they are arranged in two irregular broad rows, one each side of the median line. Front very spiny. Antennae about half the length of the body; tips of II–V and all of VI and VII black, rest pale; VII but little longer than VI; with few scattered hairs. Eyes red. Legs short, rather stout, yellowish with dusky tarsi. Honey tubes yellow, with a large thickened rim at the tip, 0.17 mm. long.

Winged viviparous female: General color yellowish green. The black hairs of the apterous form are wanting. Head brown. Thorax black. Antennae rather more than half the body in length; III as long as IV and V together, VI longer than VII; colored as in the apterous female. Eyes red. Wings rather large, with a broad blackish brown stigma and robust costal and subcostal. All the veins of both front and hind wings with broad smoky black bands. Second discoidal of front wing very sharply curved toward the body near its apex. Front pair of legs yellowish, with dusky joints and tarsi; middle pair darker, only base of femora and middle portion of tibiae yellow; hind pair nearly all black. Abdomen with a longitudinal row of tubercles each side of the median line, each segment bearing two tubercles, one each side of the line. Honey tubes as in apterous female but rather longer. Tail short and knobbed, hairy, concolorous with abdomen. Length of body 2.60 mm., to tip of wings 4.40 mm.

On the under side of leaves, along the midrib and larger veins of Bur oak (*Quercus macrocarpa*). Very plentiful during the seasons of 1889 and 1890 at Ashland. The winged form was first found May 14, 1890, and by the twenty-fifth they were very numerous. The apterous oviparous females were found plentifully in September and October. They do not differ from the other apterous form except in shape and in having the abdomen drawn out posteriorly as is common in this genus. All of the forms of this species have less hair on the antennae than any other species known to me. The antennae are more like *Callipterus*, but all the other characters are those of *Chaitophorus*.

Specimens in collection of the University of Nebraska (no. 35) and of the U. S. National Museum (no. 49).

30. **Chaitophorus viminalis** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., Vol. V, No. 1, p. 31 (1879).
Thomas, Ins. Ill., 8th Rep., p. 200 (1879).

Apterous individuals: Varying from pale green to light yellow, with two darker vittae on the abdomen which are often obsolete. Entire insect covered with long white hairs.

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Winged individuals: Head and thorax black; abdomen black, except the margins and tail, which are yellow. Honey tubes a little longer than thick, yellowish, often slightly fuscous. Antennae hairy; VII filiform, almost as long as the three preceding taken together. Wings hyaline. Length of body 1.52 mm., to tip of wing 2.54 mm. (Monell).

Apterous form on leaves of heart-leaved willow (*Salix cordata*). Weeping Water, August 18, 1890. Monell says the venation of the wings is exceedingly variable.

Specimens in collection of the University of Nebraska (no. 36) and of the U. S. National Museum (no. 50).

Genus **Callipterus**

31. **Callipterus asclepiadis** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., Vol. I, p. 29 (1879).
Thomas, Ins. Ill., 8th Rep., p. 197 (1879).
Oestlund, Syn. Aph. Minn., p. 42 (1887).

Apterous individuals: Uniformly yellowish or whitish; somewhat tuberculate on dorsum, with long white capitate hairs. Antennae shorter than body, all but two first joints black tipped, VII longer than VI.

Pupa: Similar to apterous form, with pale wing-pads, antennae generally shorter and body longer.

Winged individuals: General color yellow. Antennae filiform, about the length of the body, VII nearly twice as long as VI, all but two basal joints black tipped. Beak reaching to second pair of coxae. Thorax with a dark marginal stripe on the sides. Legs pale. Wings with a dusky brown, irregular band running from the apex of the second discoidal to the apex of the second branch of the cubitus and to apex of stigmal vein, and another band extending from the apex of the first discoidal to the base of the cubitus, but becoming scattered before reaching that point. Veins blackish. Stigma short, broad, angled, tapering abruptly at its outer end. Distance between the tips of first and second discoidals twice that between the tip of the second discoidal and the tip of the first branch of cubital. Hind wings with veins only very slightly smoky at the tips. Abdomen with four irregular rows of brown spots and smaller spots scattered among these. Honey tubes short, slightly longer than broad, yellow. Length of body 1.50 to 1.60 mm., to tip of wings about 2.80 mm.

On under side of leaves of milkweed (*Asclepias syriaca*), generally only a few are to be found on a leaf. Weeping Water, September 8, 1889; Ashland, August 25, 1890. I find the venation rather variable. This species has the habit of jumping when disturbed. It is able to jump several inches.

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Specimens in collection of the University of Nebraska (nos. 37, 38) and of the U. S. National Museum (no. 19).

32. **Callipterus caryae** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., Vol. V, No. 1, p. 31 (1879).
Thomas, Ins. Ill., 8th Rep., p. 199 (1879).

Apterous individuals: General color pale greenish yellow. Legs and antennae pale, the latter with the tip of each joint black. Head with four capitate bristled tubercles on front. Dorsum with four rows of brownish tubercles, each with a single capitate bristle on its summit.

Pupa: As in apterous form, with whitish wing-pads.

Winged individuals: Pale yellow. Antennae about as long as the body, pale, the tip of each joint black; VII generally longer than VI. Thorax pale olive. Legs all whitish but the last joint of the tarsi which is dusky. Abdomen with four rows of blackish tubercles on its dorsum; these, however, lack the capitate bristles and the rows are not so regular as in the larvae and pupae. Honey tubes subobsolete. Tail short and knobbed. Wings hyaline. Veins pale; second branch of cubitus equidistant from apex of wing and the first branch, rather widely forked. Stigma short and broad, obtuse at both ends, dirty white with dusky base. Stigmal vein subobsolete. Length of body 1.75 mm., to tip of wings 2.85 mm.

Found on under side of leaves of hickory (*Carya amara*) and walnut (*Juglans nigra*). Ashland, August 23, 1890.

Specimens in collection of the University of Nebraska (nos. 39, 40) and of the U. S. National Museum (no. 20).

33. **Callipterus discolor** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., V, No. 1, p. 30 (1879).
Oestlund, Syn, Aph. Minn., p. 41 (1887).
Thomas, Ins. Ill., 8th Rep., p. 108 (1879). *Myzocallis bella.*

Apterous form: Color pale yellowish, with about four rows of dark green spots along the dorsum; sometimes these are almost obsolete, especially in the younger individuals. Covered with long capitate hairs. Antennae pale, with the articulations black.

Winged form: General color greenish yellow. Head somewhat darker. Thorax with a dusky band on either side. Abdomen with four rows of irregular brownish spots, often with smaller dots between them, the two middle rows more or less confluent just above the honey tubes. Head pointed in front. Eyes red. Antennae about as long as the body; tips of III–VI dusky to black; III longest, VII longer than VI. Legs pale. Tarsi dusky. Wings with irregular dusky spots, arranged in two oblique bands, which are especially noticeable when the insect is at rest; a smoky patch at tips of all the oblique veins; stigma short. Honey tubes short, greenish yellow. Length of body about 1.75 mm., to tips of wings 3.30 mm.

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On under side of leaves of Bur oak (*Quercus macrocarpa*). Weeping Water, October 10, 1888; Ashland, October, 1889; very plentiful all through the month.

34. **Callipterus punctata** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., V, No. 1, p. 30 (1879).
Thomas, Ins. Ill., 8th Rep., p. 198 (1879).

Apterous form: Pale yellowish; dorsum with small tubercles from which proceed capitate hairs of various lengths. Antennae not reaching honey tubes, the latter longer than broad, concolorous with abdomen. Front with 6–8 very long capitate white hairs and a shorter one on the inner side of I and II, rest of antennae smooth, dusky, jointed; VII longer than VI. Eyes red.

Pupa: Similar, with pale wing-pads.

Winged form: Color much as in apterous form, but with thorax and some few markings on the abdomen darker. Head pointed in front. Eyes red. Antennae shorter than body; pale, with tips of joints III–VI dusky; VII longer than VI, dusky. Wings hyaline, with dusky markings at all the tips of the oblique veins and the base of the stigmal; subcostal and stigma greenish white; the latter broad, angled at the base of the stigmal vein, which is sharply curved. Honey tubes as in the apterous form, but more conspicuous. Legs pale with dusky tarsi. Abdomen not tubercled, but with a few capitate hairs. Length of body 1.70–2.10 mm., to tip of wings 3–3.40 mm.

On under side of leaves of Bur oak (*Quercus macrocarpa*). Ashland, May 28, 1890.

I find specimens which lack the darker markings on the wings and are larger, agreeing with the description of *C. hyalinus*, together with the above; and upon the same leaf specimens with only a part of the markings on the wings. I am of the opinion that *C. hyalinus* is but a variety of *C. punctata.*

35. **Callipterus trifolii** Monell.

Monell, Can. Ent., Vol. XIV, p. 14 (1882).

Apterous form: Yellow. The very young individuals have four longitudinal rows of tubercles each with a single blackish capitate hair. In the maturer individuals the tubercles are not arranged in longitudinal rows (except sometimes the outer marginal row), but are in rather irregular transverse rows on each segment, the whole dorsum being very thickly covered with them, even to the head and thorax. Antennae reaching to honey tubes. Length of body about 1.80 mm.

Pupa: Similar but smaller and with whitish wing-pads.

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Winged form: "Dorsum without conspicuous tubercles. III twice as long as IV; IV and V subequal; VI and VII subequal. Wings with marginal cell hyaline. Veins bordered with brown. Basal half of stigmal vein subobsolete and not thickened and dusky at the base. Length of body 1.60–2 mm., to tip of wings about 3.30 mm., antennae 2.40 mm." (Monell).

Ashland, apterous form quite common on leaves of red clover (*Trifolium pratense*) during the month of September, 1890.

Specimens in collection of the University of Nebraska (nos. 41, 42) and of the U. S. National Museum (no. 22).

36. **Callipterus ulmifolii** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., Vol. V, No. 1, p. 29 (1879).
Thomas, Ins. Ill., 8th Rep., p. 111 (1879). *C. ulmicola.*
Oestlund, Syn. Aph. Minn., p. 42 (1887). *C. ulmifolii.*

"Pale whitish yellow. Apterous individuals: Tuberculate, with capitate hairs, which disappear when the insect acquires wings."

"Winged individuals: Antennae as long as the body; III, IV and sometimes V slightly dusky at apex; apical joint a very little longer or shorter than the sixth. Wings hyaline; all the veins and especially the stigmal vein subhyaline. Dorsum with four long, spine-like tubercles on its basal portion and with various shorter tubercles on the apical portion."

"Length 1.77 mm., to tip of wings 3.04 mm."

On under side of leaves of elm (*Ulmus americana*), evidently causing them to cup slightly. Lincoln, October 4, 1888, and June 13, 1890. Ashland, June to July, 1890.

Specimens in collection of the University of Nebraska (nos. 43, 44) and of the U. S. National Museum (no. 23).

37. **Drepanosiphum acerifolii** (Thomas).

Thomas, Bull. Ill. Lab. Nat. Hist., 2, p. 4 (1878). *Siphonophora acerifolii.*
Thomas, Ins. Ill., 8th Rep., p. 47 (1879). *Siphonophora acerifolii.*
Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 27 (1879). *Drepanosiphum acerifolii.*
Oestlund, Syn. Aph. Minn., p. 46 (1887). *Drepanosiphum acerifolii.*

Apterous form: Pale green. Antennae very long, pale, with articulations and the very long thread-like VII dusky. Eyes red. Legs pale, with dusky joints and tarsi. Honey tubes very large at base, tapering, with a rimmed apex, pale. Tail none.

Winged form: Color gray varied with white and brown. Head and thorax brown, with various whiter markings. Antennae much longer than

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the body, pale, with darker articulations, growing darker towards the tips, VII dusky to black; as long as, or becoming much longer than, III; the latter with a single row of sensoria. Beak short, not reaching to middle coxae. Legs pale, with dusky tips and tarsi, rather long. Abdomen with several large, more or less brown, tooth-like tubercles on the basal segments of the dorsum, each tipped with a short stiff hair, and marginal spots of brown. These latter are often obscure or wanting. Wings large; veins slender, more or less bordered with brown, especially the cubital and stigmal veins. The border becomes broadened into a black patch at the margins of the wing. Stigma short and broad, angled, gray, with dusky margins. Stigmal vein very sharply curved at first, then almost straight, with the smoky band thickest at each end. Marginal cell very broad. Honey tubes very much enlarged at the base, dusky, 0.35 mm. Tail short and knobbed, pale. Length of body about 2.40 mm., to tip of wings 3.95 mm.

Very common on maple (*Acer dasycarpum*). Ashland, Lincoln, Weeping Water. The past season at the former place they were so thick as to cover almost all plants in the vicinity of the maples, when the winged form was most plentiful (September–October). It is a very pretty louse and varies much in size and coloration.

Specimens in collection of the University of Nebraska (nos. 45–49) and of the U. S. National Museum (no. 226).

Genus **Melanoxanthus**

38. **Melanoxanthus bicolor** Oestlund.

Ashland, on *Salix,* October 10, 1890, specimen no. 49a, University of Nebraska collection.

Tribe **APHIDINI**

Genus **Hyalopterus**

39. **Hyalopterus pruni** (Fabricius).

Fabricius, Ent. Syst., IV, p. 213 (1794). *Aphis pruni.*
Kaltenbach, Mon. Pflan., p. 52 (1843). *Aphis pruni.*
Koch, Die Pflan., p. 22, figs. 29, 30 (1854). *Hyalopterus pruni.*
Buckton, Mon. Brit. Aph., II, p. 110, pl. LXXV, figs. 1–3 (1879). *Hyalopterus pruni.*
Thomas, Ins. Ill., 8th Rep., p. 82 (1879). *Hyalopterus pruni.*

Apterous viviparous female: Long oval, pale green with darker mottlings. Dorsum with a more or less distinct longitudinal stripe of darker

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green. Generally very pulverulent. Eyes brown. Honey tubes shorter than tail, black. Tail green. Legs pale, with black tarsi.

Pupa: Elongate, nearly linear, green, very pulverulent; head and thorax darker. Eyes red. Antennae two thirds as long as the body, whitish. Legs and wing-pads whitish. Tarsi dusky. Abdomen with sides nearly parallel and drawn out to a gradual point behind; a median line of dark green, a transverse row of impressed dots at base, and a similar row on each lateral margin, also a row of very small tubercles on the sides. Honey tubes hardly as long as the tarsi, dusky. Tail short and conical, pale. Beneath pale green, mesosternum darker; abdomen with a row of marginal dots, corresponding to those above. Length of body 2.40 mm.

Winged viviparous female: Head and thoracic lobes very dark green, rest paler green, more or less pulverulent. Head pointed in front. Prothorax with very small lateral tubercles. Antennae on very small frontal tubercles; about two thirds as long as the body, pale; VII longest; III with a few sensoria. Eyes red. Legs pale, with femoral tips and tarsi dusky, rather slender and the hind pair rather long. Beak very short, not reaching middle coxae, in many specimens hardly reaching beyond the front coxae. Wings hyaline, with slender brownish veins and long, pointed, grayish stigma; cubital subobsolete at immediate base; second branch arising much nearer the apex of the wing than to the base of the first branch. Abdomen marked as in pupa, but more oval in outline, drawn out into a conspicuous, hairy, concolorous tail, which is at least as long as the honey tubes; these latter as in pupa. Length of body 2.42 mm., to tip of wings 3.70 mm.

On under side of leaves of cultivated plums, on the same trees with *Myzus cerasi* and *Phorodon humuli.* Ashland, June, 1890; Weeping Water, June, 1889.

Genus **Aphis**

40. **Aphis albipes** Oestlund.

Oestlund, Syn. Aphid. Minn., p. 52 (1887).

Apterous viviparous female: Reddish brown, paler beneath. The young are greenish. The thorax a transverse dash on each side of the anterior of abdomen, a similar one at base of honey tubes, a short longitudinal dash between and in front of the honey tubes on the dorsum, and some of the apical segments white and pulverulent. Antennae about half the length of the body; white, except tips of IV and V, and all of VI, which are blackish; VII longest. Beak reaching beyond middle coxae. Eyes red. Honey tubes about two thirds as long as the tarsi, dusky to black. Legs white with dusky tarsi. Tail short, conical, whitish.

Winged viviparous female: Antennae not as long as the body, black;

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III–V with a few small sensoria; VII longer than III. Eyes red. Beak reaching middle coxae. Head and thorax dark brown to black. Prothorax brownish, with small lateral tubercles. Wings with yellowish insertions, subcostal and stigma, the latter rather short and broad, somewhat pointed; veins slender, blackish; second branch of cubital nearer the first than to apex of wing. Abdomen greenish brown, with darker transverse markings. Legs pale, with dusky joints and tarsi. Honey tubes short (0.10 mm.), subclavate, black. Tail about as long as honey tubes, acutely conical, whitish. Anal plates blackish. Length of body about 2.15 mm., to tip of wings 3.60 mm.

On under side of snowberry (*Symphoricarpus racemosus* var. *pauciflorus*) and Indian currant (*S. vulgaris*). Elmwood, Ashland, Belmont, War Bonnet Canyon. More common than *A. symphoricarpi* Thomas. It causes the leaves to curl as does that species. My specimens differ somewhat from Oestlund's description, but I am sure it is his species. The stigma can not be said to be long, however. The white markings distinguish it very readily from Thomas's species.

Specimens in collection of the University of Nebraska (nos. 50, 51) and of the U. S. National Museum (no. 54).

41. **Aphis annuae** Oestlund.

Oestlund, List Aph. Minn., p. 43 (1886).

Oestlund, Syn. Aph. Minn., p. 66 (1887).

Apterous viviparous female: Very dark green. Antennae shorter than body, dusky. Abdomen short and broad. Honey tubes about twice the tarsi, black, or with pale base. Tail short and conical.

Winged viviparous female: Head and thorax shining black; the former pointed in front. Antennae shorter than body, on very inconspicuous tubercles, black; VII longer than III. Prothorax without lateral tubercles, black. Wings long and narrow; second branch of cubitus much nearer the apex of the wing than to the first branch. Abdomen dull green, generally with a marginal row of black spots. Legs pale to dusky. Honey tubes about twice the tarsi, black. Tail cylindrical, about half the honey tubes, black. Length of body about 2 mm., to tip of wings about 3.50 mm.

On leaves, sheaths and stems of bluegrass (*Poa compressa*). Ashland, September to October, 1890. I think the insects are generally lighter colored earlier in the season.

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Specimens in collection of the University of Nebraska (no. 52) and of the U. S. National Museum (no. 52).

42. **Aphis apocyni** Koch.

Koch, Die Pflan., p. 97, figs. 131, 132 (1854).

Thomas, Ins. Ill., 8th Rep., p. 94 (1879).

Pupa: Yellowish green to light olive green. Head brownish. Antennae about two thirds as long as the body, pale, with dusky tips. Eyes dark red. Legs pale, with dusky tarsi. Wing-pads and thorax pale. Honey tubes longer than tarsi.

Winged viviparous female: Head and thorax black. Eyes dark red. Antennae shorter than body, pale, darker toward the tips. Beak reaching middle coxae. Prothorax blackish, with lateral tubercles. Wings hyaline; insertions, subcostal, stigma and the slender oblique veins yellowish; discoidals uncommonly straight. Legs yellowish, with dusky joints and tarsi; sometimes the hind pair are darker. Abdomen yellowish green, with darker marginal spots and transverse band on the segments behind the honey tubes. Honey tubes but little longer than tarsi, dusky black. Tail about half as long as honey tubes, blackish, upcurved, rather acute. Beneath the sternum and coxae are dusky black; abdomen pale yellowish, green; anal plates dusky black. Length of body 2.10 mm., to tip of wings 3.60 mm.

On dogbane (*Apocynum cannabinum*), generally along the upper branches and flower stalks. Elmwood, June 9, and Ashland, June 11, 1890.

Oestlund is evidently wrong in considering this the same as *A. asclepiadis* Fitch. My specimens differ much from the typical *A. asclepiadis,* though I have found that species on this same plant, but only when in close proximity to *Asclepias,* upon which it was also very numerous. The only thing in which my specimens differ from Koch's description is in being generally of a lighter color.

Specimens in the collection of the U. S. National Museum (no. 53).

43. **Aphis artemisicola** n. sp.

Apterous form: Body reddish wine-colored. Antennae shorter than body, black, with three first joints paler. Eyes black. Head, thorax and abdomen reddish wine colored, the latter with marginal row of black dots. Legs reddish, with dusky to black joints and tarsi. Honey tubes black, 0.35 mm. long. Tail acute, hairy, black, about one half the honey tubes in length.

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Winged form: Antennae shorter than the body, on inconspicuous tubercles, black; VII longer than III. Head and thorax black. Neck and prothorax reddish. Wings rather heavy and large, with yellowish insertions. Abdomen, honey tubes and tail as in apterous form except that the honey tubes and tail are slenderer. Legs all black. Beak reaching beyond second pair of coxae, black tipped and very acute. The abdomen is very large in both forms; sometimes almost spherical, giving the insects a broadly pear-shaped outline. Length of body 2.83 mm.

A very large aphis, moving quickly when disturbed, with a jerky motion. In size and general appearance it is very like a *Siphonophora;* but the generical characters are undoubtedly those of *Aphis.*

On *Artemisia cana,* generally on the upper leaves and ends of branches. Squaw Canyon, June 24, 1890.

Cotypes in collection of the University of Nebraska (no. 53) and of the U. S. National Museum (no. 56).

44. **Aphis atriplicis** Linnaeus.

Linnaeus, Fn. Sv., p. 1000 (1761).
Schrank, Fn. Boi., II, 109, 1196 (1801). *Aphis chenopodii.*
Kaltenbach, Mon. Pflan., p. 107 (1843).
Buckton, Mon. Brit. Aph., II, p. 87, pl. LXV, figs. 4–7 (1879). *A. atriplicis.*

Apterous viviparous female: Green, more or less pulverulent, elliptical. Antennae pale, with dusky tips, hardly half the body in length. Eyes dark red. Legs short, pale, with slightly dusky tarsi. Honey tubes very slender, subclavate, slightly dusky, especially at the tips, hardly as long as the conspicuous, upcurved, concolorous tail.

Winged viviparous female: Somewhat larger than apterous female, ovate. Head and thorax black. Eyes dark reddish brown. Antennae hardly two thirds the body in length, black, with pale base, minutely annulate; III longest, with a single row of large sensoria. Beak short, not reaching the middle coxae. Prothorax brownish, without lateral tubercles. Wings with yellowish insertions and subcostal and robust, smoky black oblique veins. Stigma dusky, rather long, but very obtuse. Legs dusky to blackish. Honey tubes as in apterous female, but more dusky. Tail more slender and acute. Abdomen green, with brown marginal spots and transverse bands, these latter often more or less obsolete. Length of body 1.60 mm., to tip of wings 3 mm.

Very common on pigweed (*Chenopodium* sp.) in June and July, and sometimes on dock (*Rumex* sp.). The lice cluster

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along the midrib on the upper side of the leaves and cause the edges to roll upwards, enclosing the lice in its folds. My specimens agree with the description given by Kaltenbach much better than with that by Buckton.

Specimens in the collection of the U. S. National Museum (no. 58).

45. **Aphis canae** n. sp.

Apterous form: General color green, darker on head and central subcircular spot on abdomen. In some individuals this spot is very irregular, giving the abdomen a mottled appearance. There is generally a whitish transverse band just behind the thorax. Antennae about half the body in length, pale, tips black. Legs pale, tarsi black. Honey tubes black, about 0.15 mm. long. Tail short, conical, black.

Winged form: Head and thorax black. Antennae shorter than the body, two basal joints dusky; III and lower part of IV paler, remainder dusky to black; IV but little shorter than III, V shorter than IV, VI two thirds V and equaling VII. Whole of antennae annulated. Prothorax without lateral tubercle. Wings rather delicate, with slender brownish veins. Stigma dusky. Stigmal vein curved gradually for its entire length. Legs with upper part of femora and upper part of tibiae pale, remainder black. Abdomen green with some darker mottlings. Honey tubes black, 0.16 mm. long, slightly swollen above the base. Tail short, conical, black. Length of body 1.24 mm. to tip of wings 2.25 mm. The apterous viviparous female is about 1.60 mm. in length. It also has the abdomen very broad and frequently the antennae nearly all black.

A very pretty species found on the stem and leaves of *Artemisia cana,* generally in company with *Siphonophora artemisiana.* Squaw Canyon, June 24, 1890.

Cotypes in collection of the University of Nebraska (no. 54) and of the U. S. National Museum (no. 60).

46. **Aphis chrysanthemicola** n. sp.

Apterous viviparous female: Green, slightly pruinose. Antennae about one half the body in length; I. II, III and sometimes IV pale, remainder dusky black. Eyes red. Beak reaching to third pair of coxae, acute, black tipped. Legs with all of the femora and tibiae green. Tarsi black. Honey tubes long, reaching almost or quite to the tip of the abdomen, slightly swollen near the tip, with green bases and dusky tips. Tail one third the honey tubes, concolorous with the abdomen. Length of body 1.25 to 1.50 mm.

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Pupa: Similar to apterous form, but with shorter and darker antennae, honey tubes and tail, and legs with dusky tibiae. Wing-pads dusky.

Winged viviparous female: General color dark green (lighter in immature individuals). Head brownish black, pointed in front. Antennae black, with paler bases, on inconspicuous tubercles, about two thirds the body in length; III rather longer than VII; VI, VII and part of V annulated; III, IV and V with a few circular sensoria. Eyes black. Neck and prothorax green. The latter without lateral tubercles. Thorax with a broad central black band, sides yellowish green. Wings with rather pointed apex, yellowish insertions and very prominent black veins. Stigma dirty white. Stigmal vein only slightly curved. The marginal cell but little broader than the stigma. Second branch of cubitus generally much nearer the first branch than the apex of the wing. Legs yellowish green, with tips of tibiae dusky; tarsi dusky to black. Abdomen green with dark green marginal dots and two or three brownish green bands behind the honey tubes. Honey tubes reaching to base of tail, otherwise as in apterous form. Tail as in apterous form, or sometimes slightly dusky. Length of body about 1.50 mm., to tip of wings 3 mm.

On both sides of the leaves of *Chrysanthemum* in the greenhouse of the botanical department of the State University, December 30, 1890. Brookings, S. D., 1894–95.

Cotypes in the collection of the University of Nebraska (nos. 55, 56).

47. **Aphis cnici** n. sp.

Apterous viviparous female: General color reddish brown. Antennae but little more than half the body in length, dusky, with pale base. Legs with base of femora yellowish, rest dusky to black. Honey tubes twice the tarsi in length, black. Tail short, acute, black.

Pupa: Color, size, honey tubes, legs, antennae and tail as in apterous form. Head rather smaller. Wing-pads dusky to black. Insect as large as the winged form.

Winged viviparous female: General color reddish brown. Head small in comparison to the size of the insect, very dark reddish brown to black. Antennae black, pale at base, reaching to or slightly beyond the base of the honey tubes, on inconspicuous frontal tubercles; III and VII subequal; III and IV with sensoria. Neck and prothorax greenish brown, the latter with lateral tubercles, a blackish line on its front margin and a brown dot on either side of its center. Beak very long, reaching beyond the third pair of coxae, two last joints blackish, last very acute. Thorax with lobes, ventral surface and a spot in front and just below the base of each wing, black; membrane yellowish brown. Wing insertions, costal, subcostal and stigma yellowish; oblique veins very slender, pale brown; the discoidals

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and cubitus originating equidistant and continuing very nearly parallel to the margin of the wing. Stigmal vein curved rather sharply and evenly its entire length. Second branch of cubitus originating, generally, equidistant from the first branch and the apex of the wing. Legs with the basal portion of femora yellowish, all the rest black. While the insects are living the abdomen appears as if without any darker markings, but when mounted in balsam a row of brown spots can be seen on each margin, and within these a row of impressed dots; apical segment drawn out into a blackish point, causing the insect to appear as if supplied with two tails. Honey tubes black, very finely annulated, 0.50 to 0.60 long. Tail short (0.15 mm.), very acute, blackish. The whole insect in all forms is covered with numerous short, bristly hairs which are most abundant on the legs and antennae. Length of body about 3 mm., to tip of wings about 5.15 mm.

On stems, branches and leaves of thistle (*Cnicus* sp.), in very large colonies. War Bonnet Canyon, June 23, 1890.

This is the largest aphis that I have ever seen. It is somewhat like *A. cardui* Linn., but is much larger, differently colored and differs in many other respects as will be seen by the description. I do not think that it can possibly be that species, especially as given by Buckton. There is another aphis found on the same plant, which I take to be *A. cardui,* though it differs in a few points from that species, as given by European authors. Buckton thinks that his insect is different from *A. cardui* of Passerini and it is possible that my insect may be Passerini's species; but as I have no description of his insect I cannot determine that point. I think it probable, however, that they are distinct. Oestlund notices the long beak of his *A. cardui* and the same feature is to be noticed in this insect and in an undetermined species feeding on the same plants. When we remember that these plants generally have thick skins supplied with many long hairs, the necessity of a long beak is at once recognized.

Cotypes in collection of the University of Nebraska (no. 57) and of the U. S. National Museum (no. 64).

48. Aphis cucumeris Forbes.

Ashland, August, 1890, on cucumber and hollyhock, specimens nos. 58 and 59, collection of the University of Nebraska.

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49. **Aphis euphorbiae** Kaltenbach.

Kaltenbach, Mon. Pflan., p. 94 (1843).

Koch, Die Pflan., p. 89, figs. 119, 120 (1854).

Apterous viviparous female: Broadly ovate, general color dark bluish black; thickly pulverulent. Antennae reaching nearly to base of honey tubes, pale yellowish. Eyes black. Prothoracic and thoracic segments well defined, the former with lateral tubercles. Abdomen arched. Legs pale yellowish. Honey tubes and tail subequal in length, both dusky to black.

Pupa: Rather larger; legs and antennae rather dusky. Thorax and wing-pads almost white, with pulverulence. Otherwise similar to female.

Winged viviparous female: General color much as in the apterous female but with less pulverulence and head and thorax shining black. Prothorax with lateral tubercles. Antennae and legs pale, or sometimes more or less dusky. Wings with yellowish insertions, subcostal and stigma, the latter angled at the ends; second branch of cubital arising much nearer the apex of wing than to first branch. Abdomen carinate; dorsum with transverse rows of impressed pits. Honey tubes slender, 0.20 mm. long, dusky to black. Tail fully as long as honey tubes and generally lighter colored. Anal plates blackish. Length of body 2.10 mm., to tip of wings 3.70 mm.

On upper leaves and flower stalks of common spurge or milkweed (*Euphorbia corollata*). Weeping Water, August 22, 1890. Easily distinguished by its dark color and white pulverulence.

Specimens in collection of the University of Nebraska (nos. 60, 61) and of the U. S. National Museum (no. 67).

50. **Aphis frangulae** Kaltenbach.

Kaltenbach, Mon. Pflan., p. 64 (1843). *A. rhamni.*

Koch, Die Pflan., p. 119, figs. 161, 162 (1854). *A. rhamni.*

Koch, *l. c.*, p. 142, figs. 192, 193. *A. frangulae.*

Apterous viviparous female: Size small, general color yellowish green to dark olive green, with two or three darker green stripes on the dorsum, which run together more or less. Eyes dark red. Antennae about two thirds as long as the body, yellowish, with dusky tips. Prothoracic segments with prominent lateral tubercles. Honey tubes hardly as long as the tarsi, pale yellowish to dusky. Tail almost as long as honey tubes, obtuse, yellowish to dusky. Legs yellowish with dusky tarsi. Length of body 0.90–1.20 mm.

Winged viviparous female: Rather smaller than apterous female. Head and thoracic lobes black. Antennae black, with part of III and IV pale; shorter than body. Prothorax with lateral tubercles. Beak reaching middle coxae. Legs rather short, yellowish, with tips of femora and tibiae and tarsi blackish. Wings delicate, hyaline, with yellowish insertions, subcostal

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and stigma. Abdomen yellowish green, with generally three longitudinal dark green stripes as in apterous. Honey tubes blackish, about twice the length of the yellowish tail. Anal plates brown.

Along the midrib on the under side of leaves of buckthorn (*Rhamnus lanceolatus*). July, Fremont, Wabash. When mounted in balsam the dark green stripes disappear and a row of impressed dots can be seen along the carinae. One of the smallest aphids that I am acquainted with.

Specimens in collection of the University of Nebraska (no. 62) and of the U. S. National Museum (no. 66).

51. **Aphis helianthi** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 26 (1879).
Oestlund, Syn. Aph. Minn., p. 52 (1887).

Apterous viviparous female: Pale to dark green, with various darker markings, especially just before the honey tubes, where there is a transverse band. Eyes blackish. Honey tubes dusky, 0.20 mm. long. Tail short, acute, more or less dusky.

Winged viviparous female: Head and thorax dark brown to black. Abdomen green, with a dark green transverse band just before the honey tubes and generally some dark marginal spots. Antennae about two thirds as long as the body, black; III as long as IV and V together and longer than VII; IV and V subequal. Eyes very dark brown to black. Honey tubes dusky to black, 0.20 mm. long, subcylindrical. Tail as in apterous form. Wings hyaline, with a broad, dusky stigma; second branch of cubital arising much nearer the apex of wing than to base of first branch. Length of body 1.80 mm., to tip of wings 3.20 mm.

Very common on under side of leaves of sunflower (*Helianthus annuus*), generally but not always corrugating them. June–September. Ashland, Lincoln, Weeping Water.

Specimens in collection of the University of Nebraska (nos. 63, 64) and of the U. S. National Museum (nos. 82, 83, 332).

52. **Aphis impatientis** Thomas.

On *Impatiens pallida,* August 22, 1890, specimens nos. 65 and 66, collection of the University of Nebraska.

53. **Aphis lilicola** n. sp.

Apterous viviparous female: Color varying from green to dark green and variously mottled. Slightly pulverulent, more conspicuously so on the head and margins of abdomen. Antennae very slender and thread-like.

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about half the length of the body, whitish, dusky at base and apices Beak reaching beyond middle coxae. All of the coxae brown. Legs pinkish white, with dusky femoral tips and black tibial tips and tarsi. Abdomen distinctly carinated, often with one or two marginal rows of dark impressed dots. Honey tubes greenish black, about twice the tarsi in length. Tail either same color as abdomen or sometimes darker.

Pupa: Much smaller than apterous form and much more thickly pulverulent. Legs, antennae and honey tubes as in the above. Bases of wing-pads white, remainder black.

Winged viviparous female: Green. Head blackish brown. Antennae brown to black, with paler articulations, on inconspicuous tubercles, reaching almost or quite to base of honey tubes. Neck green. Prothorax brown, with very small but distinct lateral tubercles. Thorax blackish brown. Wing insertions and subcostal yellowish. Stigma conspicuous, dusky, with a yellowish tinge. Veins brown to blackish. Legs greenish to dusky, with dusky to black joints and tarsi. Abdomen green, with marginal spots, irregular transverse rows of brownish spots, a large brown spot at the inner side and to the rear of the base of each honey tube, and one or two more or less distinct transverse bands between these and the apex. Honey tubes dark brown to black, about twice the tarsi in length. Tail short, conical, obtuse, hairy, yellowish to dusky green. Anal plates brown. The ventral surface of the thorax has a very characteristic broad, blackish transverse band, which has two large lobes on its posterior edge. The coxae are blackish brown. Length of body 1.80 mm., to tip of wings 3.50 mm.

Found on the growing points of lily (*Lilium candidum*) in greenhouse. Lincoln, January 12, 1891.

This may be *A. lilii* Lichtenstein (ined.), mentioned by him in his *Les Pucerons,* p. 100 (1885). I have not been able to find his description so give my louse the above name, which it can hold till it is shown certainly to be his species. It is a very well characterized species.

Cotypes in collection of the University of Nebraska (nos. 67, 68) and of the U. S. National Museum (no. 15).

54. **Aphis lonicerae** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., Vol. I, p. 26 (1879).
Oestlund, Syn. Aph. Minn., p. 55 (1887).
Thomas, Ins. Ill., 8th Rep., p. 104 (1879). *Chaitophorus lonicera.*

Apterous form: General color green, very pulverulent, more or less covered with flocculency. Antennae hardly two thirds the body in length, dusky at tips. Eyes very dark red or black. Beak reaching beyond the

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middle coxae. Honey tubes mammiform, shorter than broad. Tail hardly if at all distinct. Length of body about 3 mm. Pupa similar, with pale greenish wing-pads.

"Winged individual: Green, often with two darker green longitudinal stripes. Head and thorax brownish. Antennae about as long as the body, frontal tubercles short, but distinct; apical joint filiform, as long as the two preceding taken together. Beak reaching below the middle coxae. Wings hyaline, stigma rather long. Honey tubes scarcely projecting above the surface of the abdomen. Lateral edge of the abdomen with four or five very short, green, mammiform tubercles. Tail not perceptible. Length 2.54 mm., to tip of wings 4.57 mm." (Monell).

On under side of leaves of wild honeysuckle (*Lonicera glauca*). Ashland, October 5, 1889, and May 10, 1890. These insects have at first sight much the appearance of *Schizoneura* on account of the great amount of flocculent matter covering them and the liquid globules found in the curled up leaf, which curling is caused by the punctures made by the beaks of the lice. The only winged specimen that I found had the thoracic tubes all black.

Specimens in collection of the University of Nebraska (no. 69) and of the U. S. National Museum (no. 88).

55. **Aphis lonicericola** n. sp.

Apterous viviparous female: Reddish purple, pulverulent. Tarsi, tips of antennae and tips of honey tubes dusky. Head small. Antennae reaching to base of honey tubes; the two basal joints frequently dusky; very slender and thread-like; III longest. Beak short, hardly reaching to the middle coxae. Legs slender, pale. Abdomen broad, very much swollen, arched and wrinkled; abruptly pointed at each end. Honey tubes very slender, yellowish, dusky tipped, about 0.37 mm. long. Tail short, acutely conical; same color as the honey tubes. Tip of abdomen and anal plates brown. The large abdomen and small head give the insect a very characteristic, broadly ovate appearance. Beginning with the middle of the margin on each side, it tapers in almost exactly the same proportion toward either end. Length of body 2.50 to 2.80 mm.

Pupa: Color as in apterous female. Size smaller. Head larger. Eyes darker. Legs, antennae, honey tubes and tail similar. Wing-pads brownish.

On wild honeysuckle (*Lonicera parviflora*), causing the leaves to curl much more than *A. lonicerae* Mon., but with very little if any flocculent matter. Ashland, October 5, 1889, and May 14, 1890.

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Cotypes in the collection of the University of Nebraska (no. 70) and of the U. S. National Museum (no. 87).

56. **Aphis lugentis** n. sp.

Apterous viviparous female: Dark green. Legs and antennae black, the latter half the body in length. Abdomen with very distinct margins upon which is a row of impressed dots. Honey tubes black, nearly twice the tarsi. Tail black, half the honey tubes.

Pupa: Lighter colored, with dusky black head, antennae, legs, honey tubes, wing-pads and tail; the latter conical, short and broad.

Winged viviparous female: Antennae black, hardly half the body in length; III longer than VII, but shorter than VI and VII together; VII very slender. Eyes dark red. Head dusky black. Neck green. Prothorax darker, with small, slender, lateral tubercles. Thorax black. Legs all black but the immediate bases of femora. Wing insertions yellowish. Wings hyaline, with slender brownish veins; cubitus with second branch but very little nearer to the apex of the wing than to the first branch. Stigma smoky black, rather short, acute at outer end. Abdomen green, with four large black spots on each lateral margin, a row of impressed dots just within these, a few irregularly placed brown spots over the dorsal surface, a transverse band of brown between the honey tubes and one on each segment from there to the tip. Honey tubes not quite twice the tarsi in length, black. Tail black, hairy, about half as long as the honey tubes. Length of body 2.30 to 2.85 mm., to tip of wings 3.95 to 4.15 mm.

This very large aphis is found on the stem, leaves and flower stalks of *Senecio lugens.* War Bonnet Canyon, June 23, 1890.

Cotypes in the collection of the University of Nebraska (no. 71) and of the U. S. National Museum (no. 91).

57. **Aphis lutescens** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 23 (1879).

Thomas, Ins. Ill., 8th Rep., p. 191 (1879).

Apterous viviparous female: General color bright lemon yellow. Outline broadly ovate. Head dusky. Eyes very dark red or black. Antennae hardly half the body in length, dusky, with black tips. Beak reaching beyond middle coxae. Legs dusky to black, generally with bases of femora and a portion of tibiae yellowish. Honey tubes tapering from a broad base, reaching to tip of abdomen, blackish. Tail short, club-shaped, obtuse, hairy, blackish. Anal plates blackish.

Pupa: Very similar but with shorter honey tubes, conical tail and size rather smaller. Wing-pads dusky.

Winged viviparous female: General color bright lemon yellow. Antennae somewhat pilose, a little shorter than body, the length of joints

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quite variable; in some specimens the third is subequal to the preceding, while in others it is one third longer. VII filiform, very much longer than III. Honey tubes somewhat dusky, gently tapering from base to apex, apical diameter about two thirds that of the base, about three times as long as the tarsi. Tail dusky yellow, blunt at apex, when fully extended about half the length of the honey tubes. Fore wings hyaline; stigma dusky yellowish, acute at apex, which is opposite the middle of the stigmal vein. Stigmal vein in one regular curve. Discoidal veins of hind wings nearly parallel; subcostal comparatively straight. Length of body 1.65–2.03 mm., to tip of wings 3.04–3.54 mm. (Monell).

On milkweed (*Asclepias incarnata* and *A. syriaca*). Elmwood, Lincoln, Ashland. June–September.

Specimens in the collection of the U. S. National Museum (nos. 89, 90).

58. **Aphis maidis** Fitch.

Fitch, Ins. N. Y., I, p. 318 (1856).
Thomas, Ins. Ill., 8th Rep., p. 89 (1879).
Garman, Ins. Ill., 14th Rep., p. 23 (1885).
Garman, Misc. Es. Ec. Ent., p. 46 (1886).
Oestlund, Syn. Aph. Minn., p. 56 (1887).

ROOT FORM

Apterous viviparous female: Head black above. Prothoracic segment black, the following three body segments each with a transverse dusky mark on their middles. Abdomen pale green, with black marginal spots and with numerous smaller specks over the surface. Antennae dusky at tip and slightly also at base. Eyes reddish brown. Honey tubes black. Tail dusky, preceded by two transverse black marks. Abdomen beneath with two transverse black marks before the tail, otherwise nearly uniformly pale green below. Beak black at base and tip. Coxae, femora chiefly, tips of tibiae and tarsi black. Body widely oval in outline. Antennae short, about half the length of the body and head; I and II equal in length; I largest; III longest; IV and V subequal and about equal to VI. Honey tubes short, tapering toward the tip, not swollen, extremities flared. Tail short and wide. Length of body 1.40 mm., width of body 0.93 mm., antennae 0.57 mm.

Pupa: Head obscurely dusky. Thorax obscure reddish brown. Abdomen pale, dull green, without spots. Antennae dusky at tip only. Eyes reddish brown. Wing-pads obscurely dusky. Honey tubes black. Tail dusky. General color below greenish. Beak dark at base and tip. Tarsi and tips of tibiae dusky. Length of body 1.61 mm., width 0.30 mm.

Winged oviparous female: Head black. Thorax brownish black. Abdo-

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men above pale green with about three marginal black spots and numerous small dark specks over the surface. Antennae dark, with pale at the articulations. Prothorax pale in the middle; mesothorax and metathorax chiefly brown. Honey tubes black, with some black at their bases, chiefly inside. Tail dusky, with several transverse dusky marks before it. Thorax chiefly dark below, with interspaces about bases of limbs brownish. Under side of abdomen pale green; two transverse dark marks before the tail. Legs mostly black; tibiae for basal two thirds pale. Length of body 1.80 mm., of antennae 0.70 mm., of honey tubes 0.12 mm.

Oviparous female: General color dull green, body covered with a glaucous bloom. Above head dusky, prothorax chiefly dusky, the three succeeding segments each with a median transverse dusky blotch; all segments behind prothorax with a marginal and submarginal series of dusky specks on each side. Below head and prothorax dusky, two dark spots outside the coxa of the middle leg, a dusky line before the coxa of the hind leg, abdominal segments with two series of dusky specks on each side and a pair of spots before the tail. Antennae dusky, the lower part of III and IV paler. Eyes brownish red. Beak dusky. Anterior and middle legs with coxae, femora except bases, tibiae at tips and tarsi except at bases dusky. Posterior leg excepting the extreme base of femur black. Honey tubes black. Tail with black border. Body stout, its greatest width at about the middle. Outline of the front seen from above incurved medially. Antennae with I and II equal in length, I stouter; III about equal to IV and V together, IV and V nearly equal in length and similar in form. Honey tubes short, not swollen in middle. The limbs and tail have the usual pubescence of members of the genus *Aphis*. Length of body 2.27 mm., width 1.20 mm., antennae 0.80 mm., honey tubes 0.20 mm.

AERIAL FORM

Apterous viviparous female: General color pale green, with tail, honey tubes, greater part of beak, antennae and legs black. Head with two broad, approximated, longitudinal bands of dark brown, which give the prevailing color. Abdomen with the usual marginal black spots and black patch about the base of the honey tubes. Antennae dark at base and apex. Eyes reddish brown. Anterior legs mostly pale. Beak dark at base and apex. More slender than the female of the root form and of a brighter green color. Honey tubes slightly swollen in the middle. Length of body 1.97 mm., width 1 mm., antennae 0.75 mm., honey tubes, 0.17 mm.

Pupa: Head dark brown, presenting the appearance of two longitudinal dark bands. Body chiefly pale green. Wing-pads, honey tubes and tip of tail black. Antennae chiefly dark. Beak dark at base and tip. Legs nearly all dark, tibiae pale proximally. Length of body 1.60 mm., width 0.62 mm., antennae 0.70 mm., honey tubes 0.12 mm.

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Winged viviparous female: Head black. Thorax chiefly black above. Abdomen pale green, faintly bluish at the sides, with three marginal spots on each side preceding larger spots which surround the bases of the honey tubes. Antennae chiefly black. Honey tubes black. Tail green, edged with black. Segments behind the tail dark-edged. Head and thorax beneath chiefly black. Abdomen pale green, with two transverse black marks preceding the tail. Legs pale at their articulations; middle part of tibiae often pale. Beak chiefly black. Body more slender than that of the female of the root form. Antennae rather long; IV and V each longer than VI. Honey tubes moderately long, swollen in the middle. Length of body 2 mm., width 0.87 mm., antennae about 0.85 mm., honey tubes 0.20 mm., to tip of wings about 3.35 mm. (Garman).

The root form was found at Weeping Water, June, 1889, on the roots of corn, so plentiful as to destroy a large part of five acres of grain. The corn was just coming through the ground or the largest but one or two inches high. The lice were clustered along the young roots and stalks under the ground in great numbers, causing the stalks to wilt and shrivel up. The first notice of the presence of lice at a hill of corn was invariably given by the appearance of a colony of ants (*Lasius alienus* Forst.?), which are responsible principally for the rapid spread of the lice over the field.

The aerial form was found in abundance at Weeping Water in July and August, 1890, on corn and sorghum, generally more plentiful on the latter. They were generally a little larger than Garman's specimens, and the honey tubes were not so much swollen; in many cases (in both winged and apterous forms) they were not swollen at all. These lice are destroyed by the larva of a *Syrphus* fly, which seemed to be quite effectually keeping them in check. Professor Forbes, who has been experimenting on the life history of this aphis for some years past, expresses doubt as to these two forms belonging to the same species. He has as yet been unable to establish a complete connection.

Specimens of the "aerial form" in the collection of the University of Nebraska (nos. 72, 73).

59. **Aphis malvae** Walker.

Walker, Cat. Hom. Brit. Mus., IV, p. 970 (1852).
Koch, Die Pflan., p. 125, figs. 169, 170 (1854).

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Buckton, Mon. Brit. Aphid., II, p. 42, pl. XLIX, figs. 1, 2 (1879).

Apterous viviparous female: Somewhat oval. Head brown between the antennae, but sometimes the color is reddish. Rest of body yellow or pale green. Legs rather short, pale green; tarsi darker. Honey tubes straight and cylindrical. Tail but little developed. The vertex and tail pilose. Length of body about 1.50 mm., of honey tubes 0.38 mm.

Winged viviparous female: Much smaller than the wingless female. Head, part of prothorax and all of thorax rich brown. Vertex convex, not pointed. Abdomen arched. Rest of insect fine yellow, with indistinct lateral punctures. Antennae shorter than body, pale brownish yellow. Legs, honey tubes and tail pale green. Tarsi grayish. Eyes red. Wings short and rounded at the tips; insertions and subcostal yellow; veins brown; stigma gray. Length of body about 1.25 mm., of honey tubes 0.25 mm., expanse of wings 4.81 mm.

Apterous oviparous female: Very much of the form and color of the viviparous female. Antennae half the length of body. Honey tubes olive (Buckton).

The apterous form of an aphis which agrees exactly with Buckton's description was taken at Ashland November 1, 1890, on the under side of the leaves of hollyhock (*Althaea* sp.). Winged insects were taken later (January 23, 1891) on *Hibiscus* in greenhouse at Lincoln. These agree very well with Buckton's description, but some specimens have black head and thorax, very small lateral tubercles on the prothorax, a dark green spot at the base of each honey tube and the honey tubes and tail black, thus agreeing with the description given by Koch. There is no doubt that these belong to the same species and I think that the darker ones are the more mature individuals. Apterous and viviparous females were taken often on *Hibiscus* later.

Specimens in the collection of the University of Nebraska (nos. 74, 75) and of the U. S. National Museum (no. 100).

60. **Aphis medicaginis** Koch.

Koch, Die Pflan., p. 94, figs. 125, 126 (1854).

Monell, Bull. U. S. Geol. Sur. Ter., V, No. 1, p. 24 (1879).

Thomas, Ins. Ill., 8th Rep., p. 192 (1879).

Apterous viviparous female: Broadly ovate. The living specimens appear almost black, but when mounted in balsam they have a dark reddish brown color. Legs and antennae pale yellowish, the base and tips of the latter and the femoral tips of the hind pair of legs, all the tibial tips and the tarsi dusky to black. Antennae not half as long as the body; III the

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longest. Honey tubes rather long (0.45 mm.), imbricated, shining black. Tail short, slender, acute, black. Anal plates blackish.

Winged viviparous female: General color of living specimens black. Head and thorax shining black. Prothorax and abdomen dull black (in mounted specimens these latter are dark reddish brown). Prothorax with very small lateral tubercles. Abdomen with three black marginal spots on each side of beak, not reaching to middle coxae. Antennae on inconspicuous frontal tubercles, about half the length of the body, blackish, with III paler and with a few sensoria; III to VII more or less minutely annulate. Hind pair of legs with femora black except the immediate base, the rest with distal ends of femora black; all of tibial tips and tarsi black. Wings with yellowish insertions, subcostal and stigma, the latter with dusky border; oblique veins yellowish brown. Honey tubes and tail as in apterous form, but rather shorter. Anal plates black. Length of body 2 mm., to tip of wings 3.40 mm.

On wild liquorice (*Glycyrrhiza lepidota*). Lincoln, June 3, and War Bonnet Canyon, June 24, 1890. The measurements were taken from the War Bonnet specimens which were somewhat larger than the ones from Lincoln.

Specimens in the collection of the U. S. National Museum (no. 400).

61. **Aphis middletonii** Thomas.

Thomas, Ins. Ill., 8th Rep., p. 99 (1879).
Oestlund, Syn. Aph. Minn., p. 54 (1887).

"Apterous form: The color of full grown specimen is leaden gray, with head more or less dusky; abdomen with marginal spots and also commonly some transverse bands of black. Eyes as usual in *Aphis*. Antennae short, about one third or not more than half the length of the body, dusky except at base; III longest. Beak rather long, reaching third pair of coxae (0.50 mm.). Legs more or less dusky. Honey tubes short (0.15 mm.), slightly thickest at base. Tail short, conical, hairy. Anal plates dusky or black. Length of body 1.50 to 1.75 mm."

"Winged form: Antennae about half the length of the body; III with several rather large sensoria arranged in almost a regular row. Ocelli present but small, the two lateral ones close to the compound eyes. Beak reaching second pair of coxae. Head and thorax black, abdomen dull green as in apterous, with a lateral row of dusky spots and more or less pulverulent. Wings as usual in the genus. Honey tubes short, almost as long as the tarsi, cylindrical."

On roots of daisy fleabane (*Erigeron ramosus*) and common fleabane (*Erigeron canadensis*). Lincoln, July 20, 1890; golden-

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rod (*Solidago canadensis*), Lincoln, October, 1888. On underground stems of naked broom rape, August 6, 1889, at Alliance (J. G. Smith). The Alliance specimens are larger than those on the composites, being about 1.9 mm. long; they also have VII subequal to or slightly longer than III.

62. **Aphis mimuli** Oestlund.

Oestlund, Syn. Aph. Minn., p. 57 (1887).

Apterous viviparous female: Light green or occasionally becoming darker green or the darker green arranged in longitudinal bands on the dorsum.

Winged viviparous female: General color green. Head and thorax dark brown to black. Antennae pale, with blackish tips; III–V with sensoria; III equal to VII; IV and V subequal; VI three fourths of V. Beak reaching hind coxae. Legs pale, with black femoral and tibial tips and tarsi. Neck and prothorax green, the latter with very slender lateral tubercles. Wings delicate, with slender brownish veins; stigma pointed, dusky; stigmal vein curved its entire length; second branch of cubital nearer the apex of the wing than to base of first branch. Abdomen pale green, generally with a longitudinal dorsal stripe of darker green. Honey tubes rather longer than the tarsi, green. Tail slightly shorter than honey tubes, conical, green. Length of body 1.15 to 1.20 mm., to tip of wings about 1.66 mm.

Found on stems, branches, flower stalks and leaves of monkey flower (*Mimulus ringens*), causing the leaves to curl up. Fremont, July 31, 1890.

Specimens in the collection of the University of Nebraska (nos. 76, 77) and of the U. S. National Museum (no. 94).

63. **Aphis oenotherae** Oestlund.

Oestlund, Syn. Aph. Minn., p. 69 (1887).

Apterous viviparous female: Color from light pea green to dark green. Tarsi and tips of antennae dusky. Eyes black.

Pupa: Green. Tarsi, tips of antennae, wing-pads and tip of beak dusky.

Winged viviparous female: Head and thorax black. Antennae about two thirds the length of the body, black, generally with paler bases; III, IV and sometimes V with sensoria; III and VII subequal; all the joints more or less minutely annulate. Beak of medium length. Prothorax with lateral tubercles, green or in many specimens with a more or less distinct transverse brownish band. Abdomen bright green, with a marginal row of brown or black spots and in many specimens more or less distinct transverse brownish bands, especially on the segments behind the

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honey tubes. Legs with yellowish brown femora and tibiae and black joints and tarsi. Honey tubes about three times the tarsi, brown to black, about 0.30 mm. long. Tail hardly half as long as the honey tubes, acute, from yellowish green to black. Length of body about 1.50 mm., to tip of wings 3 mm.

On upper branches, leaves and seedpods of evening primrose (*Oenothera biennis*). Quite common at Ashland in May, 1890, and October, 1889, and at Lincoln, June, 1890. On *Oenothera serrulata,* War Bonnet Canyon, June 24, 1890. It causes the leaves to curl up somewhat. There seems to be considerable variation in the color of this aphis. The spring forms have generally less dark markings than the summer or fall forms.

Specimens in the collection of the University of Nebraska (nos. 78, 79, 80) and of the U. S. National Museum (nos. 96, 97, 98, 99).

64. **Aphis parthenocissi** n. sp.

Apterous viviparous female: Uniformly reddish brown. Antennae with two first joints dusky; III, IV and V white; VI and VII black; VII longest. Eyes very dark red. Beak very long, reaching beyond the third pair of coxae. First pair of legs pale, with black joints and tarsi; second pair darker, the tibiae with both ends blackish; third pair all black, but a small portion of the middle of each tibia and the immediate base of the femora. Abdomen arched, very broad in comparison to the small and narrow head and thorax, giving the body a pear-shaped outline. Honey tubes black or sometimes paler at base, 0.28 mm. long. Tail about half as long, rather conical, black. Anal plates blackish brown.

The very young larvae have all parts pale but the tips of the antennae and the tarsi; as they grow older the dark markings become more and more prominent. Length of body 1.60 to 1.80 mm.

Readily recognized by its reddish color and pale, black tipped antennae. It differs from *A. setariae* (Thomas) in having a black tail, paler antennae (the white portion taking in the fifth joint) and a much longer beak. This latter is by far the longest I have ever seen in this genus. In the very young individuals it reaches nearly or quite to the tip of the abdomen.

Found clustering along the midrib of the leaflets and along the petioles of the Virginia creeper (*Parthenocissus 5-folius*), thickly attended by ants. Lincoln, August 7, 1890. I watched the vine upon which it was found very closely till the close of the month

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but was unable to secure any winged specimens. Oestlund mentions finding *A. setariae* (Thomas) on this plant, but I think that it was very likely this species.

Cotypes in the collection of the University of Nebraska (nos. 81, 82) and of the U. S. National Museum (no. 101).

65. **Aphis pentstemonis** n. sp.

Apterous form: Green, with scarcely any darker markings.

Winged form: General color green. Antennae all black or sometimes with slightly paler bases on inconspicuous tubercles; III longest. Head black, rather pointed in front; eyes red, with black tubercle. Neck green. Prothorax brown, with slender lateral tubercles. Thorax with black lobes and green membrane. Wings with slender brownish veins; cubitus with second branch nearer to the apex of the wing than to the first branch; first and second discoidals nearly straight; stigmal vein curved for its entire length. Stigma rather broadly lanceolate, generally obtuse, or short pointed at the outer end. Legs dusky, the hind pair frequently almost black; joints and tarsi black. Abdomen green, with three or four large marginal spots on each side and a row of impressed dots just within these; a brown spot at the base of each honey tube and transverse bands behind these. Some specimens have a few irregular bands on front part of the abdomen, while in some these are wanting and the other dark markings are not so noticeable. Honey tubes one and one half to two times as long as the tarsi, black. Tail one half the honey tubes, rather sharply conical, black. Length of body 2.20 mm., to tip of wings 3.75 mm.

Found on *Pentstemon glaber,* clustering along the flower spikes, stems and leaves. What is evidently the same species was found on *Musenium tenuifolium,* growing near the *Pentstemon.* War Bonnet Canyon, June 23, 1890.

Cotypes in the collection of the University of Nebraska (nos. 83, 84) and of the U. S. National Museum (no. 102).

66. **Aphis rumicis** Linnaeus.

Linnaeus, Syst. Nat., I, 2, p. 734 (1746).
Fabricius, Ent. Syst., IV, p. 213 (1794).
Kaltenbach, Mon. Pflan., p. 81 (1843).
Koch, Die Pflan., p. 140, figs. 190, 191 (1854).
Buckton, Mon. Brit. Aph., II, p. 81, pl. LXIII, LXIV (1879).
Thomas, Ins. Ill., 8th Rep., p. 88 (1879).
Oestlund, Syn. Aph. Minn., p. 61 (1887).

Apterous viviparous female: Color varying from green to brownish.

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Antennae pale, black tipped. Legs pale, joints and tarsi black. Honey tubes and tail black, the latter one half the former. Outline broadly ovate.

Winged viviparous female: General color black, the abdomen sometimes paler. Antennae nearly as long as the body; black, minutely annulate; III longest, with many irregularly arranged sensoria. Head and thorax shining black. Prothorax with a lateral tubercle. Front legs yellow, joints and tarsi black; middle legs darker and hind pair black except the base of femora and upper middle portion of tibiae. Wings with slender veins. Stigma elongate and very acute, dusky. Honey tubes black, 0.30 mm. long. Tail half as long as honey tubes, black, rather acute, hairy. Length of body about 2 mm., to tip of wings 4 mm.

On dock (*Rumex* sp.), generally along the upper branches and flower stalks. Buckton describes both apterous male and apterous oviparous female.

Specimens in the collection of the University of Nebraska (no. 85) and of the U. S. National Museum (no. 113).

67. **Aphis salicicola** (Thomas).

Thomas, Bull. Ill. St. Lab. Nat. Hist., 2, p. 8 (1878). *Siphonophora salicicola.*

Thomas, Ins. Ill., 8th Rep., pp. 63 and 192 (1879). *Siphonophora salicicola.*

Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 24 (1879). *Aphis salicicola.*

Oestlund, Syn. Aph. Minn., p. 63 (1887). *Aphis salicicola.*

Winged viviparous female: Head and thorax shining black; prothorax with lateral tubercles; head somewhat pointed in front. Antennae on inconspicuous frontal tubercles; not quite as long as the body, black; III longest, with numerous small, round sensoria. Eyes black. Wings hyaline, with slender brown oblique veins; subcostal and stigma dusky, the latter rather long; cubital obsolete at base, with second branch very much nearer the apex of wing than to the first branch. Legs rather long, nearly all black. Abdomen dark green, with irregular dorsal markings. Honey tubes imbricated, black, 0.28 mm. long. Tail curved upward, dusky, hairy, at least one third as long as the honey tubes. Length of body 1.65 mm., to tip of wings 3.40 mm.

On willow (*Salix discolor*). Lincoln, War Bonnet Canyon. No notes were made from the Lincoln specimens and there were only very young apterous forms in the War Bonnet specimens, so I can give no description of that form. Although this aphid has a few of the characters of *Siphonophora,* it plainly belongs in *Aphis* as now understood.

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Specimens in the collection of the U. S. National Museum (no. 107).

68. **Aphis saniculae** n. sp.

Apterous form: Uniformly green, with honey tubes, tail and legs generally darker than in winged form. Length of body about 1.90 mm.

Pupae: Similar in color, honey tubes and tail lighter; wing-pads brownish. Length of body about 1.50 mm.

Winged female: General color green. Antennae pale to dusky; III darkest, a little longer than VII. III, IV and V with a single row of sensoria; III with the most and V with the least. Head brown. Eyes reddish. Neck green. Prothorax light brown, with lateral tubercles. Thorax brown, with greenish yellow lateral margins. Wings with yellowish insertions, conspicuous brown veins and yellowish stigma. Stigmal vein curved for its entire length. Second branch of cubitus nearer the apex of the wing than to the first branch. Abdomen yellowish green, with three small brown marginal dots on each side and one at the base of each honey tube. Honey tubes and tail blackish, the latter acute, about one half the former. Legs dusky. Tarsi brown to black. Antennae shorter than the body. In a few specimens there are two or three pale brown bands behind the honey tubes. Length of body about 1.50 mm., to tip of wings about 2.50 mm.

On under side of leaves of *Sanicula canadensis,* causing them to curl up into a pseudogall. Ashland, May 30, 1890, and War Bonnet Canyon, June 21, 1890.

Cotypes in the collection of the University of Nebraska (no. 86) and of the U. S. National Museum (no. 109).

69. **Aphis sativae** n. sp.

Apterous form: Very dark greenish brown to almost black. Antennae on inconspicuous frontal tubercles; brown, with base darker and three apical joints blackish; about as long as the body. Beak reaching almost to hind coxae. Legs brown, with the tip of hind femora, all the tibial tips and tarsi blackish. Honey tubes robust, 0.22 mm. long, not quite twice the tarsi, black. Tail short, conical, concolorous with honey tubes. Body short and broad, about 1.55 mm. long.

Pupa: Same color as apterous form and similar in every respect except that the head is rather larger, the size considerably smaller and the body more slender. Wing-pads blackish.

Winged individual: Blackish brown. Head, thorax, antennae, legs, honey tubes, tail and marginal spots on abdomen black. Wings with medium sized, brown veins; the subcostal nearly straight; the costal curved, coming quite near to the subcostal just below the stigma, which is narrow

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and dusky. The wings have a brownish tint. Honey tubes rather shorter than in apterous form. Tail short and broadly conical, hairy. Antennal tubercles less distinct than in apterous form. Length of body generally a little less than that of apterous individuals and outline narrower.

Among the flowers of hemp (*Cannabis sativa*). Weeping Water, October 10, 1888. This cannot be *Phorodon cannabis* Pass., as that species has porrect frontal tubercles and is of a much paler color.

Cotypes in the collection of the University of Nebraska (no. 87) and of the U. S. National Museum (no. 108).

70. **Aphis senecionis** n. sp.

Apterous viviparous female: Dark olive green. Legs dusky to blackish brown, with black joints and tarsi. Antennae not half the body in length. Abdomen with a row of impressed dots on each side. Honey tubes dusky brown.

Pupa: Lighter green, with blackish wing-pads; legs, antennae and honey tubes dusky.

Winged viviparous female: Antennae but little more than half the body in length; dusky to black; III longest, twice VII, which is only about one and one half times VI. Head blackish. Eyes black. Neck and prothorax green, the latter with very small lateral tubercles. Thorax black. Wings with very slender brownish veins; cubitus obsolete at base; second branch nearer to apex of wing than to first branch. Stigma rather short and broad, dusky, obtuse at outer end. Legs all black but bases of femora. Abdomen green, with impressed marginal dots and the general color of the margins of a darker green. Honey tubes short, about the length of the tarsi, black. Tail nearly as long as the honey tubes, dusky, black. Length of body 1.50 mm., to tip of wings 2.95 mm.

This species has the seventh joint of the antennae the shortest of any with which I am acquainted. On upper part of stem, leaves and flower stalks of *Senecio canus*. War Bonnet Canyon, June 20, 1890. It is so plentiful at times as to cover nearly the entire plant.

Cotypes in the collection of the University of Nebraska (no. 88) and of the U. S. National Museum (no. 110).

71. **Aphis setariae** (Thomas).

Thomas, Bull. Ill. Lab. Nat. Hist., 2, p. 5 (1878). *Siphonophora setariae.*

Thomas, Ins. Ill., 8th Rep., pp. 56, 192 (1879). *Siphonophora setariae.*

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Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 23 (1879). *Aphis setariae.*
Oestlund, Syn. Aph. Minn., p. 67 (1887). *Aphis setariae.*

Apterous viviparous female: Subglobose. General color brownish red. Antennae on inconspicuous tubercles, reaching to base of honey tubes; I, II, tips of IV and V and all of VI and VII brown; VII longest. Eyes dark red. Legs yellowish, with dusky femoral and tibial tips and tarsi. Honey tubes tapering, dusky to black, 0.36 mm. long. Tail short, slender, pale.

Pupa: Elongate. Head brown. Antennae similar in color but less than half the body in length. Wing-pads brownish. Honey tubes similar but shorter. Tail not noticeable.

Winged viviparous female: Antennae at least as long as the body, on inconspicuous frontal tubercles; III–V with sensoria; VII one and one half to two times as long as III. Thorax dull black. Prothorax with lateral tubercles. Legs pale, with black joints and tarsi. Wings hyaline; discoidals equidistant at base; second branch of cubital arising much nearer the apex of wing than to first branch; stigma acute, dusky. Abdomen pale to reddish brown. Honey tubes dusky to black, 0.20–0.30 mm. long. Tail pale, nearly as long as the honey tubes. Length of body about 1.35 mm., to tip of wings 3 mm.

On barnyard grass (*Panicum crus-galli*), foxtail (*Setaria glauca* and *S. viridis*), and many other grasses. Ashland, Lincoln, Weeping Water.

Specimens in the collection of the University of Nebraska (nos. 89, 90) and of the U. S. National Museum (no. 114).

72. **Aphis solidaginifoliae** n. sp.

Apterous oviparous female: When young they are of a bright reddish brown color, with eight longitudinal rows of impressed dots on the dorsum. The mature individuals are dark red-brown, with transverse bands of blackish brown on each segment of the body; these are paler on the prothoracic segments. A row of impressed dots extends along each side of the body from the head to the tail. Head brown. Eyes black. Antennae with no frontal tubercles; tips of the joints black; VII longest and imbricated; III–V with a few scattered sensoria, and each with several stiff spreading hairs; all the joints irregular in shape. Beak hardly reaching the middle coxae. Legs very short, reddish, with tips of tibiae and tarsi dusky. Coxae brown. Honey tubes short (0.10 mm.), black. Tail short, conical, black. Anal plates blackish brown. Whole insect more or less covered with long, spreading hairs. Outline elongate oval, rather drawn out at each end. Length of body 2 mm.

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Found on *Solidago canadensis.* Ashland, September 20, 1890. It works on the upper side of the leaves, along the midrib and causes a downward swelling of the central portion of the leaf and a corresponding upward curling of the margins, so that the lice are completely surrounded. They are preyed upon by the larva of a small syrphid fly, which gets within the gall and soon destroys its occupants. Two or three individuals were found which I think were males, but a dissection was necessary to determine that conclusively, but I was unable to do so, owing to circumstances that made it impossible. They differed but little from the females. In many of the galls eggs of a greenish yellow color were found quite plentiful. The aphids were watched for some time but neither pupae or winged forms could be found. The general appearance of the louse is similar to *S. amygdali* (Fouse), but it differs in honey tubes, antennae and tail and in lacking the large marginal spots found in all the forms of that species.

Cotypes in the collection of the University of Nebraska (nos. 91, 92) and of the U. S. National Museum (no. 111).

73. **Aphis symphoricarpi** Thomas.

Thomas, Bull. Ill. St. Lab. Nat. Hist., 2, p. 12, 1878, and Ins. Ill., 8th Rep., p. 99 (1879 (in part)).

Oestlund, Syn. Aph. Minn., p. 50 (1887).

Apterous viviparous female: Green; the stem-mother is generally somewhat brownish. Head brownish. Eyes red. Antennae about two thirds as long as the body, minutely annulate; I and II brown; III, IV and V whitish except the tips, which together with VI are black; VII pale, as long as III. Legs pale, with dusky femoral and tibial tips and tarsi. Honey tubes dark, shorter than the hind tarsi. Tail nearly as long as the honey tubes, yellowish. The stem-mother is broadly oval in outline and 2.80 mm. long.

Pupa: Pale green, smaller than the apterous females. Wing-pads pale greenish.

Winged viviparous female: Head and thorax black. Antennae not as long as the body; III–V with sensoria; VII longer than III. Eyes dark brown. Wings with yellow insertions, heavy straight subcostal, prominent blackish oblique veins and broad stigma. Second branch of cubital arising nearer the base of the first branch than to the apex of the wing. Abdomen green, with black marginal spots and more or less broken, transverse bands on the dorsum. Legs black, with base of femora and sometimes a

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portion of tibiae paler. Honey tubes black, cylindrical, about equaling the tarsi in length. Tail very short, conical, hairy, greenish yellow. Length of body 2–2.30 mm., to tip of wings 3.50–3.80 mm.

On under side of leaves of snowberry (*Syphoricarpus racemosus* var. *pauciflorus*) and Indian currant (*S. vulgaris*), causing them to curl up and die. Generally most plentiful at the upper ends of the branches. Often a whole clump of the bushes are to be seen with the leaves twisted all out of shape by this species and *A. albipes* Oest. Ashland, May, 1890; Elmwood, June; War Bonnet Canyon, June, 1890.

Specimens in the collection of the University of Nebraska (no. 93) and of the U. S. National Museum (nos. 315, 329).

74. **Aphis vernoniae** Thomas.

Thomas, Bull. St. Lab. Nat. Hist., No. 2, p. 10 (1878).
Thomas, Ins. Ill., 8th Rep., p. 97 (1879).
Monell, Bull. U. S. Geol. Sur. Ter., V, No. 1, p. 23 (1879).

Apterous viviparous female: Color from green to yellowish. Antennae light colored or brownish, only about one third the body in length. Eyes black, rather large and prominent. Beak reaching to hind coxae. Honey tubes pale, cylindrical, twice the size of the obtuse club-shaped tail and longer than the tarsi. Tail yellowish. Legs pale, with dusky joints and tarsi. Abdomen large and broad for the size of the insect.

Winged viviparous female: General color yellow. Head and thoracic lobes dusky. Antennae pale to dusky, about two thirds the body in length; IV, V and VI subequal. Eyes black. Abdomen all yellow. Honey tubes yellowish, as in the apterous form, but longer. Tail pale or yellowish. Legs as in apterous. There is one form with black thoracic lobes and more or less of green on the abdomen.

On leaves and flower stalks of ironweed (*Vernonia fasciculata*). Lincoln, October 8, 1888; Weeping Water, October 10, 1888, and Ashland, October 2, 1889.

Specimens in the collection of the University of Nebraska (no. 94).

75. **Aphis viburni** Scopoli.

Scopoli, Ent. Carn. (1763).
Kaltenbach, Mon. Pflan., p. 78 (1843).
Koch, Die Pflan., p. 122, figs. 165, 166 (1854).
Buckton, Mon. Brit. Aph., II, p. 77, pl. LXI (1879).
Thomas, Ins. Ill., 8th Rep., p. 96 (1879).

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Apterous viviparous female: Green to olive green, pulverulent. Antennae very short, only about one fourth the body in length, the three apical joints blackish. Beak reaching almost to hind coxae, black tipped. Legs pale green, except tarsi and tarsal end of tibiae, which are blackish. Honey tubes rather short, blackish. Tail not noticeable, but the abdomen prolonged into a conical tip. Later in the season the apterous forms have but 6-jointed antennae.

Pupa: Oblong, very pulverulent. Head brownish. Wing-pads pale greenish.

Winged viviparous female: Head and thorax black. Beak reaching hind coxae. Eyes black. Antennae about two thirds as long as the body; shining black; III–V unusually robust, with sensoria, III and IV very thickly covered with them; VII filiform, much longer than III. Prothorax brown, with lateral tubercles. Wings with very large brown stigma and slender, oblique veins. Legs shining black except the immediate bases of the femora. Abdomen greenish brown, with black marginal spots and transverse bands and often a large dorsal spot. Honey tubes black, 0.30 mm. Tail acutely conical, short and hairy, brown. Anal plates blackish. Beneath with sternum and coxae blackish. Length of body 2.65 mm., to tip of wings 4.40 mm.

On snowball (*Viburnum opulus* var. *roseus*). Ashland. On April 27 the viviparous female was found and upon visiting the place the last of May no lice of any kind could be found. In September and October they again appeared. It was at this time that the 6-jointed forms were found. Joint II divides and forms III and IV of the winged form. This same variation was noticed in the plum aphis this year.

Specimens in the collection of the University of Nebraska (nos. 95, 96) and of the U. S. National Museum (nos. 317, 318).

76. **Aphis yuccicola** n. sp.

Apterous form: Green. Antennae but little more than half the body in length, pale at base, dusky to black toward the tip. Head small. Abdomen green, with transverse bands and marginal dots. Honey tubes and tail black. Legs pale with dusky joints and tarsi. Beak reaching to or beyond the third pair of coxae.

Pupa: Similar to the apterous form in color, but with head larger, honey tubes and tail shorter and size smaller. Wing-pads black.

Winged form: Antennae but little more than half the body in length, black, pale at base; III longest. Head black. Eyes dark red. Neck green. Prothorax dark green to brown, with lateral tubercles. Thorax black. Wings with broad rounded tips, slender brownish veins; second

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discoidal curved gradually for nearly its entire length; cubitus obsolete at base, second branch nearer the apex of the wing than to the first branch. Stigma dusky brown, rather narrowly lanceolate, acute at both ends. Stigmal vein with the last third nearly straight, the first two thirds rather sharply curved. Abdomen green, with black marginal dots, a green transverse band between and in front of the honey tubes, and darker bands behind them. Honey tubes and tail black, the former 0.27 mm. long, the latter about one third as long, club-shaped. Length of body about 1.73 mm., to tip of wings 3.25 mm.

Found on the flower stalks of *Yucca angustifolia,* in very large colonies, in both Sioux and Dawes counties, June to July, 1890.

Cotypes in the collection of the University of Nebraska (nos. 97, 98, 99) and of the U. S. National Museum (no. 319).

Genus **Siphocoryne**

77. **Siphocoryne pastinaceae** (Linnaeus).

Linnaeus, Syst. Nat., I, 2, p. 734 (1767). *Aphis pastinaceae.*
Fabricius, Ent. Syst., IV, p. 213 (1794). *Aphis pastinaceae.*
Koch, Die Pflan., p. 41, figs. 52–54 (1854). *Rhopalosiphum pastinaceae.*
Passerini, Gli afidi. (1860). *Siphocoryne pastinaceae.*
Thomas, Ins. Ill., 8th Rep., p. 84 (in part) (1879). *Siphocoryne pastinaceae.*
Buckton, Mon. Brit. Aph., II, p. 24, pl. XLIII, figs. 5–7 (1879). *Siphocoryne pastinaceae.*
Oestlund, List Aph. Minn., p. 36, 1886, Syn. Aph. Minn., p. 70 (1887). *Siphocoryne archangelicae.*

Apterous viviparous female: Color yellowish green, except the tarsi and tips of antennae, which are dusky. Eyes very dark red. Honey tubes clavate, reaching beyond the tip of abdomen. Tail medium sized; both honey tubes and tail green.

Winged viviparous female: General color yellowish green. Head and lobes of thorax black. Antennae black, paler at base; generally a little more than half as long as the body; VII about two thirds III, the latter very conspicuously tuberculate. Beak hardly reaching middle coxae. Prothorax greenish brown with an anterior black stripe. Legs yellowish to dusky, with darker tips and blackish tibiae. Abdomen yellowish green, with a large dorsal spot and marginal dots of dark brown. Honey tubes reaching to or beyond the tip of the abdomen, brown, clavate. Tail dusky, or in some specimens greenish, medium sized. Wing insertions yellowish; subcostal and stigma conspicuous, dusky. Stigmal vein rather sharply and evenly curved. Length of body about 2.25 mm., to tip of wings about 4.20 mm.

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On flower umbels of bull parsnip. War Bonnet Canyon, June 21, 1890. My specimens are a link between *S. pastinaceae* of Buckton and *S. archangelicae* Oestlund. I think the latter is but a variety of the former, the only differences that I can make out being a slight variation in color and IV being tuberculate in Oestlund's specimen.

Specimens in the collection of the University of Nebraska (nos. 100, 101) and of the U. S. National Museum (no. 80).

Tribe **NECTAROPHORINI**

Genus **Myzus**

78. **Myzus achyrantes** (Monell).

Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 18 (1879). *Siphonophora achyrantes.*

Thomas, Ins. Ill., 8th Rep., p. 187 (1879). *Siphonophora achyrantes.*

Oestlund, List Aph. Minn., p. 31 (1886). *Myzus malvae.*

Oestlund, Syn. Aph. Minn., p. 74 (1887). *Myzus achyrantes.*

Apterous viviparous female: Pale green, with a dark, irregular stripe on each side of abdomen; in fully developed specimens occasionally with an additional stripe near the basal part of the abdomen, extending over several segments.

Winged viviparous female: Head, prothorax and sometimes the upper segments of the abdomen brownish black; the upper part of the thorax with a narrow but conspicuous, transverse yellow band; general color of abdomen pale green, with irregular, broken, transverse, dark brown lines, three of these often becoming confluent and producing a large dark patch in the center of the abdomen just above the honey tubes. Honey tubes long, cylindrical, slightly dusky at their apices. Tail long, slender, slightly curved upward, more or less dusky. Length of antennae a little variable, as long as the body or slightly longer. Frontal tubercles approximate at base and somewhat porrect. Wings hyaline; stigma rather narrow and linear; stigmal vein very short and curved much as in the genus *Callipterus.* The forklets of the cubitus are especially variable, their length being in one case four times and in another one half that portion of the cubitus between the base of the lower branch and the base of the forklets. In the normal specimens these distances are subequal. Length of body 2.28 mm., to tip of wings 3.81 mm. (Monell).

On common amaranth (*Amaranthus* sp.). Ashland, June 20, 1890. Only the apterous form was found, but I am sure it is

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this species. It belongs to *Myzus,* as is shown by the porrect tubercles.

79. **Myzus cerasi** (Fabricius).

On cultivated plum, Lincoln, May 17, 1889, specimen no. 102, University of Nebraska collection.

80. **Myzus oenotherae** n. sp.

Apterous form: General color pea green. Antennae as long as or longer than the body, pale, tips of III and IV, outer half of V and VI and VII black; VII rather longer than III; I and tubercle gibbous on the inner side. Eyes red. Legs yellowish green, hairy, tarsi and lower end of tibiae blackish. Honey tubes long, slender, dusky at tip, reaching beyond the tip of abdomen. Tail concolorous with abdomen, rather more than half the honey tubes in length, rather acute, curved upwards, hairy.

Pupa: Similar to apterous form but with shorter antennae; VII longest; tail shorter; legs paler, and body more elongate.

Winged female: General color as in apterous form. Head and thorax with a pinkish tinge. Antennae more slender, paler; III with a single row of sensoria; VII minutely annulate. Eyes very dark red or black. Beak reaching midway between second and third pair of coxae. Wings with yellowish insertions, rather heavy, punctate, with moderately heavy veins; second branch of cubitus beginning somewhat nearer the first branch than to the apex of the wing. Stigma yellowish white. Stigmal vein sharply curved for at least two thirds its length. Legs yellowish green, with dusky joints and tarsi. Honey tubes and tail as in apterous except that the former are minutely annulated. Length of body about 2 mm.

Winged male: Smaller than female; antennae darker; I, II and base of III pale, all the remainder black; wings clearer and more delicate; legs generally darker. Length of body about 1.80 mm.

All forms more or less covered with capitate hairs. Antennal tubercles not so conspicuously gibbous in the winged forms as in the apterous form or pupae. This is one of the species of *Myzus* that shows a decided connection between that genus and *Siphonophora* and makes it doubtful if the former should be separated from the latter. This species is similar in general appearance to *M. potentillae.* It is, however, a much larger insect and differs from that species in many other respects, as will be seen in the description.

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On stem and leaves of *Oenothera biennis*. Ashland, May 25 and 30, 1890. It causes the leaves to curl up somewhat.

Cotypes in the collection of the University of Nebraska (nos. 103, 104) and of the U. S. National Museum (nos. 134, 397).

81. **Myzus plantagineus** Passerini.

Passerini, Gli afidi, p. 35 (1860).

Apterous viviparous female: Pale green, somewhat pulverulent. Antennae pale, nearly or quite as long as the body, on very prominent swollen tubercles; first joint conspicuously gibbous, apical joints dusky. Legs pale. Honey tubes reaching to tip of abdomen, very slender, green.

Winged viviparous female: General color green. Antennae as in apterous form but dusky to black, with paler base. Head and thorax black. Prothorax green. Eyes very dark red. Wings with robust black veins, narrowly bordered with smoky brown. Second branch of cubitus rather nearer to the apex of the wing than to the first branch. Stigma rather narrow, acute at outer end, dusky. Hind wings with robust, smoky black veins. Abdomen pale green, without any darker markings, except in a few specimens a darker green spot at the base of each honey tube. Honey tubes concolorous with the abdomen, slightly swollen at the tips, 0.32 mm. long. Tail concolorous with abdomen, 0.08 mm. in length. Legs pale, with dusky to black joints and tarsi. Length of body 1.45 mm., to tip of wings 2.70 mm.

On the under side of leaves and on the petioles of common plantain (*Plantago major*) near the ground. Fremont, July 31, 1890. What is probably the same thing was taken, feeding on the roots of the same plant, at Ashland, April 21, 1890.

Specimens in the collection of the University of Nebraska (nos. 105, 106) and of the U. S. National Museum (no. 135).

82. **Myzus potentillae** n. sp.

Apterous form: General color clear pea green; oval in outline. Eyes red. Antennae brownish black, paler at the base; longer than the body, on distinct, swollen tubercles. First joint swollen on inner side, III and IV tuberculate, VII longer than III. Legs pale brownish, tarsi brown to black. Honey tubes green, becoming brownish, not reaching to tip of abdomen, hardly twice the tarsi. Tail short, obtuse, hairy. The entire body covered with long capitate hairs.

Pupa: Similar in color to apterous form; body more elongate; wing-pads pale yellowish green.

Winged female: Color and eyes as in apterous form but thorax olive tinged. Antennae as in apterous form or darker; III, IV and V tuber-

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culate; VI very short. Legs brownish, with yellowish bases. Tarsi blackish. Wings with rather heavy blackish veins, the three oblique veins originating equidistant; first and second discoidals only slightly if at all curved; cubitus often with but one branch. Stigma lanceolate, acute at both ends, dirty white. Stigmal vein prominent, sharply curved. Honey tubes rimmed at the tip, dusky, greenish at base, not reaching to tip of abdomen, about twice the tarsi. Tail short, knobbed, hairy. Length of body about 1.90 mm., to tip of wings about 3.25 mm.

All forms are more or less covered with capitate hairs, the winged form having them on the head and antennae principally. Oestlund describes a species on *Potentilla anserina* under this name but afterwards concludes that it is *Myzus rosarum.* My specimens are very different from that species and produce quite a different effect on the plant.

On *Potentilla arguta.* Ashland, May 24, 1890. On the under side of the leaves, causing them to curl up.

Cotypes in the collection of the University of Nebraska (nos. 107, 108) and of the U. S. National Museum (no. 376).

83. **Myzus ribis** (Linnaeus).

Linnaeus, Syst. Nat., II, p. 733 (1767). *Aphis ribis.*
Kaltenbach, Mon. Pflan., p. 39 (1843). *Aphis ribis.*
Fitch, Trans. N. Y. Ag. Soc., XIII, p. 435 (1856). *Aphis ribis.*
Koch, Die Pflan., p. 39, figs. 50, 51 (1854). *Rhopalosiphum ribis.*
Passerini, Gli afidi, p. 31 (1860). *Myzus ribis.*
Buckton, Mon. Brit. Aph., I, p. 180, pl. XXXIV, figs. 1–4 (1876). *Myzus ribis.*
Thomas, Ins. Ill., 8th Rep., p. 76 (1879). *Myzus ribis.*
Oestlund, Syn. Aph. Minn., p. 74 (1887). *Myzus ribis.*
Weed, Psyche, V, p. 210 (1889). *Myzus ribis.*

Apterous viviparous female: Elongate oval. Color yellowish green, more or less mottled with dark green. Antennae thread-like, as long as or longer than the body, on gibbous frontal tubercles and I gibbous, pale; whole body more or less covered with whitish, capitate hairs or bristles. Front very bristly. Legs pale, with dusky tarsi. Honey tubes slender, 0.50 mm. long, often slightly clavate, pale. Tail short and conical, hairy, pale.

Winged viviparous female: Head and thorax olive brown to black. Antennae longer than the body, black; III and IV with sensoria; VII much the longest. Beak rather long. Wings large, with yellowish insertions; veins dusky yellowish; stigma dirty white. Legs pale, with dusky joints and tarsi. Abdomen with more or less distinct marginal spots and trans-

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verse bands of brown. Honey tubes much as in apterous female, but sometimes slightly dusky. Tail similar, about one third as long as the honey tubes. Length of body 2–2.50 mm., to tip of wings 3.75–4 mm.

"Winged male: Antennae, head, band on prothorax, row of dots on each side of dorsum of abdomen and transverse patch back of middle of same, black. Legs very long, with coxae, apical half of femora and apical fourth of tibiae, together with tarsi, black, the rest yellow. Honey tubes long, slender, slightly incrassate. Antennae about one third longer than body, slender, roughened with numerous sensoria; I large, thickened, about as long as II; III longer than any except VII; IV and V subequal; VI shorter than V; VII very long and slender. Tail minutely tuberculate, with several curved, stiff hairs arising from the margin. Length of body 2 mm., antennae 2.70 mm., honey tubes 0.50 mm., wing expanse 8.50 mm."

"Oviparous female: Body globose; greenish, shade varying with age of specimen. Antennae pale at base but blackish apically and at articulations. Legs pale, articulations and tarsi dusky; the thickened posterior tibiae greenish brown. Antennae short, less than half the length of the body; 6-jointed; I and II short, subequal; III and VI subequal; both longer than any of the others; IV and V subequal, about one third shorter than III; III–VI strongly tuberculate, having numerous sensoria. Tail long and large, spinosely tuberculate, with several long curved hairs arising from its dorsal surface. Beak reaching posterior margin of middle coxae. Length of body 0.75–1 mm." (Weed).

On under side of leaves of gooseberry and currant (*Ribes* sp.), causing them to blister and turn reddish. A very common species and frequently so thick as to cause considerable damage, as was the case during the season of 1889. Lincoln, Ashland, Weeping Water, Pine Ridge, War Bonnet Canyon.

There are several varieties in the state. The specimens from Pine Ridge are much more bristly than usual and of a much paler color, many having scarcely any darker markings on the dorsum. The Lincoln specimens have the honey tubes more than ordinarily clavate, but do not differ much in color from the typical form. Some forms have considerable amount of capitate hairs on the winged individuals, while others have very few or none of them.

Specimens in the collection of the University of Nebraska (nos. 109, 110) and of the U. S. National Museum (nos. 136, 137).

84. **Myzus rosarum** (Walker).

Walker. *Aphis rosarum.*

Koch, Die Pflan., p. 180, figs. 247, 248 (1854). *Siphonophora rosarum.*

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Buckton, Mon. Brit. Aph., I, p. 150, pl. XXII (bis) (1876). *Siphonophora rosarum.*

Oestlund, List Aph. Minn., p. 30 (1886). *Myzus potentillae.*

Oestlund, Syn. Aph. Minn., p. 73 (1887). *Myzus rosarum.*

Apterous viviparous female: Elongate oval. Bright green. Antennae and legs rather short. Frontal tubercles gibbous, of medium size. Dorsum more or less tuberculate and with capitate hairs arising from the tubercles. Front with a tuft of large capitate hairs. Eyes reddish brown. Segments of the abdomen plainly distinguished. Honey tubes slightly swollen near the tips. Tail short, green.

Winged viviparous female: General color green. The bristles of the apterous form wanting. Head and thoracic lobes black. Antennae about as long as the body; III longest, blackish. Beak reaching middle coxae. Wings rounded, with smoky black veins, which have narrow smoky margins expanding at the apices of the veins. Legs black, with base of femora and upper portion of tibiae yellowish. Abdomen green, with blackish marginal spots and transverse bands. Honey tubes green, sometimes dusky, cylindrical, about three times as long as the tarsi. Tail short, acute, pale green. Length of body about 2 mm.

On roses in greenhouses and in the fields. Ashland, Lincoln, Weeping Water, Omaha. I have found a form with the capitate hairs almost entirely absent.

Specimens in the collection of the U. S. National Museum (no. 138).

85. **Myzus thalictri** n. sp.

Apterous viviparous female: Clear green, with dusky legs and a large dark green spot at the base of each honey tube, the latter dusky.

Pupa: Rather paler green than the apterous form; more elongate in shape; wing-pads dusky. Antennae in both forms rather shorter than the body.

Winged viviparous female: Green. Antennae as long as the body, dusky to black. Head dusky. Eyes dark red. Neck and prothorax green. Thorax dusky to black. Wings with rather robust brownish veins; discoidals rather straight; first branch of cubital forming an almost straight line with the upper part of the vein; second branch nearer to the apex of the wing than to the first branch. Stigma yellowish. Stigmal vein sharply curved its entire length. Subcostal very heavy, smoky. Abdomen green, darker in the vicinity of the honey tubes. Legs dusky or sometimes pale, with only joints and tarsi dusky. Honey tubes black, 0.62 mm. long.

Winged male?: Smaller than female. Greenish yellow. Head larger, antennae longer, tail shorter and whole body slenderer than in the female. Abdomen with sides nearly straight and an irregular dark green band ex-

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tending across between the honey tubes. Honey tubes slenderer and somewhat shorter than in female.

Length of female 1.90 to 2.25 mm., to tip of wing 3.50 to 3.95 mm. Length of male 1.40 to 1.50 mm., to tip of wing 3.30 mm.

On the upper branches, petioles, leaves and flower stalks of *Thalictrum polygamum.* Ashland, June 11. On *Thalictrum* sp., War Bonnet Canyon, June 21, 1890. Causes the leaves to become somewhat deformed.

Cotypes in the collection of the University of Nebraska (nos. 111, 112) and of the U .S. National Museum (nos. 139, 140).

Genus **Rhopalosiphum**

86. **Rhopalosiphum dianthi** (Schrank).

Schrank, Fn. Boi., II, p. 114 (1801). *Aphis dianthi.*
Kaltenbach, Mon. Pflan., p. 42 (1843). *Aphis dianthi.*
Koch, Die Pflan., p. 42, figs. 55, 56 (1854). *Rhopalosiphum dianthi.*
Buckton, Mon. Brit. Aph., Vol. II, p. 15 (1879). *Rhopalosiphum dianthi.*
Thomas, Ins. Ill., 8th Rep., p. 80 (1879). *Rhopalosiphum dianthi.*
Oestlund, Syn. Aph. Minn., p. 76 (1887); List Aph. Minn., p. 34 (1886). *R. sonchi.*

Apterous viviparous female: Color shining green, ochreous yellow or brownish yellow. Skin finely punctured, ovate. Pointed towards the apex. Head broad. Antennae shorter than the body, on rather large frontal tubercles. Honey tubes green, with black tips. Tail green, about one third the honey tubes in length. Abdomen convex, and being transparent, often seen mottled with yellow young embryos. The color is, however, exceedingly variable. In autumn it is often of an ochreous red and deeply furrowed and wrinkled.

Pupa: Much like the larva. Wing cases tipped with brown, points of antennae brown.

Winged viviparous female: Head, thorax and band on prothorax black. Abdomen shining reddish yellow, with a broad black dorsal spot, several dark lines and marginal row of black dots. Legs ochreous. Antennae black, as also are the femora, the tibial points and tarsi. Honey tubes brown. Wing insertions and subcostal yellow. Stigma gray. Rostrum reaches the second coxae. The winged form appears of various colors, such as green, ochreous and even black (Buckton).

Length of body about 2 mm. The apterous form is generally smaller.

Common on carnation pinks and various other house plants found at all times of the year in the conservatories. Ashland, Weeping Water, Lincoln, West Point.

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Specimens in the collection of the University of Nebraska (nos. 113, 116) and of the U. S. National Museum (nos. 25, 29).

87. **Rhopalosiphum dianthi** var. **poae** n. var.

This differs from the preceding in the pupa having dusky wing-pads and legs, and the winged form having III and IV of the antennae covered with many roundish sensoria, the abdomen with few darker markings, legs darker and tail very short (0.10 to 0.15 mm.) and acutely conical. The insect is somewhat smaller.

This may be distinct enough to deserve specific rank, but I have never seen winged specimens of *R. dianthi,* so am loath to put it as such till I have a better understanding of that species at least. This form is at least deserving of varietal rank.

On lower leaves and stems of bluegrass (*Poa* sp.?), in the greenhouse at the University of Nebraska, February 1, 1890.

Cotypes in the collection of the University of Nebraska (no. 119) and of the U. S. National Museum (no. 26).

88. **Rhopalosiphum nymphaeae** (Linnaeus).

Linnaeus, Syst. Nat., I, 2, p. 734 (1767). *Aphis nymphaeae.*
Fabricius, Ent. Syst., IV, p. 214 (1794). *Aphis nymphaeae.*
Schrank, Fn. Boi., II, p. 117 (1801). *Aphis nymphaeae.*
Kaltenbach, Mon. Pflan., p. 104 (1843). *Aphis nymphaeae.*
Koch, Die Pflan., pp. 26, 44, figs. 33, 34, 35, 57. *Rhopalosiphum nymphaeae.*
Koch, *l. c.,* p. 45, fig. 58 (1854). *R. najadam.*
Buckton, Mon. Brit. Aph., II, p. 12, pl. XLI, figs. 1–3 (1879). *R. nymphaeae.*

Apterous viviparous female: Broadly oval; dark olive green variously mottled with lighter green. Some specimens are quite glaucous, while others are smooth and shining. Antennae, legs, honey tubes, anal plates and tail black. Antennae about half the body in length. Beak reaching to hind coxae. Eyes dark reddish brown. Honey tubes clavate. Tail short and acute.

Pupa: Smaller; wing-pads blackish; honey tubes shorter; tail short and conical; otherwise as in the female.

Winged viviparous female: Head, thorax and antennae black, the latter on moderately sized tubercles, minutely annulate. Prothorax brown. Abdomen olive green, with three or four black marginal spots and various darker markings along the dorsum. In some specimens the darker markings are almost entirely wanting, while in others they are very prominent.

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Legs as in apterous form or sometimes with base of femora and part of tibiae yellowish. Wings with yellowish insertions and subcostal; stigma conspicuous, brown; oblique veins heavy and blackish. Honey tubes and tail as in the apterous female. Length of body 2.50 mm., to tip of wings 4.10 mm.

One of our commonest aphids. Found on *Potamogeton, Sagittaria, Ammania, Bidens, Alisma, Juncus, Naias, Typha, Nelumbo, Nymphaea, Lemna* and many other plants growing along the water's edge; generally most plentiful from July to September. Ashland, Lincoln, Weeping Water, Fremont. One of the most variable species with which I am acquainted, both with respect to size and coloration.

Specimens in the collection of the University of Nebraska (nos. 120–124) and of the U. S. National Museum (nos. 30, 31, 32).

89. **Rhopalosiphum rhois** Monell.

Monell, Bull. U. S. Geol. Sur. Ter., V, 1, p. 27 (1879).
Oestlund, Syn. Aph. Minn., p. 75 (1887).

Apterous viviparous female: General color reddish brown (in some individuals this becomes more or less of a dark green). Antennae black, with paler base. Eyes black. Beak short. Honey tubes 3–4 times the tarsi, dusky to blackish, clavate. Tail slender, same color as abdomen. Legs yellowish brown, with dusky tarsi.

Pupa: Lighter colored, often quite green. Wing-pads pale greenish. Tail very short and conical. Size smaller than the apterous female.

Winged viviparous female: Head and thoracic lobes black; rest of body varying from brown to olive green. Antennae black, a little longer than the body, on inconspicuous frontal tubercles; III and VII subequal in length, either longer than V and VI together. Wings slender, with blackish oblique veins. Legs, honey tubes and tail much as in the apterous female. The honey tubes rather longer and more clavate. Tail about one third the honey tubes in length. Length of body about 1.90 mm., to tip of wings 3.80 mm.

On under side of leaves of sumach (*Rhus glabra*). Lincoln, September, 1888; West Point, July, 1890. It varies considerably in coloration; is generally found in large companies along the midrib of the leaves.

Specimens in the collection of the University of Nebraska (no. 125) and of the U. S. National Museum (no. 24).

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Genus **Amphorophora**

90. **Amphorophora ampullata** Buckton?

Buckton, Mon. Brit. Aph., I, p. 187, pl. XXXVII, fig. 4 (1876).

Oestlund, Syn. Aph. Minn., p. 77 (1887). *Rhopalosiphum ampullata.*

Apterous viviparous female: Bright green, often with the color deepening on the dorsum and along the sides of the abdomen. Antennae very long, nearly or quite twice the length of the body, on very large frontal tubercles; pale, with the articulations blackish. Eyes dark red. Legs greenish, with tibial tips and tarsi black, rather large and long. Honey tubes reaching beyond the tip of the abdomen; green, with black tips; very much dilated in the middle. Tail hardly one third as long as the honey tubes, yellowish, upcurved. The young can be seen very plainly within the parent insect. Length of body about 3.10 mm.

On under side of leaves of an undetermined rosaceous plant. Ashland, October, 1889; quite common. I do not think that this species can be placed in the genus *Rhopalosiphum,* as is done by Oestlund. It differs from the typical members of that genus in too many particulars.

Genus **Siphonophora**

91. **Siphonophora ambrosiae** Thomas.

Thomas, Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 4 (1878).

Thomas, Ins. Ill., 8th Rep., p. 50 (1879).

Oestlund, Syn. Aph. Minn., p. 84 (1887).

Apterous viviparous female: Color dull reddish brown. Elongate oval. Antennae longer than the body, on large, conspicuous tubercles; I dark brown, II and base of III pale, remaining joints black; VII longer than III; hairy. Eyes dark red. Beak reaching hind coxae. Legs yellowish, with femoral and tibial tips and tarsi black. Abdomen with dorsum tubercled. Honey tubes black, reaching beyond tip of abdomen, 0.90 mm. long. Tail two thirds of the honey tubes in length, yellowish, upcurved, acute.

Pupa: Similar to the female, but with limbs generally shorter. Wing-pads dusky black.

Winged viviparous female: General color dark seal brown, shining. Antennae slightly longer than body, pale at base, rest black, with capitate hairs; VII longest. Abdomen without the tubercles of the apterous female. Wings with the discoidals much curved. Legs blackish except base of femora, long. Beak, honey tubes and tail much as in the apterous form, but generally a little shorter. Length of body about 2.75 mm., to tip of wings 4.75 mm.

On *Ambrosia trifida,* during the seasons of 1888–90; very common. Weeping Water, Ashland, Lincoln.

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Specimens in the collection of the U. S. National Museum (nos. 3, 381).

92. **Siphonophora artemisicola** n. sp.

Apterous form: General color of body pale green, the entire body covered with white capitate hairs, giving the insect a very pulverulent appearance and a color similar to the plant upon which it feeds. Some specimens have a row of marginal dots but these are lacking in many. All have a light brownish green medial line when first collected, which disappears when the insect is mounted in balsam. Antennae about as long as the body, but varying; VII longest; I dusky; II, III and lower part of IV paler, remaining joints black. Legs black, with upper part of femora and middle part of tibiae paler. Honey tubes black, very slender, 0.45 to 0.50 mm. in length. Tail white, short, subconical, acute, about 0.15 mm. long. Length of body 1.70 to 1.90 mm.

A very active species, similar in some respects to *S. ludovicianae* Oest. It is easily distinguished by the white, capitate hairs, short tail and other minor points.

On upper part of stem and leaves of *Artemisia cana.* Squaw Canyon, June 24, 1890. What seems to be the same thing was taken on *Cnicus lanceolatus* at Brookings, S. D., July 11, 1891. In the Dakota specimens, however, the legs, antennae and honey tubes are pale, but the colors of the body, the slender honey tubes and the abundance of capitate hairs serve to distinguish the species.

Cotypes in the collection of the University of Nebraska (no. 126) and of the U. S. National Museum (no. 4).

93. **Siphonophora carnosa** Buckton.

Buckton, Mon. Brit. Aph., Vol. I, p. 144, pl. XX (1876).

Apterous viviparous female: Large. Dark ginger brown, lilac, flesh-color or gray. Hoary, punctured, much corrugated, particularly near the carina or connexivum. Head and thorax broad. Antennae and legs ginger brown and hairy. Depressions on the first and second thoracic rings. Carina much marked and wrinkled. Tail brown. Length of body 3.30 mm.

Pupa: Smaller than the larva. Most usually of a rosy pink, with greenish wing cases. Carina distinct. The hoary coat more pronounced than in the larva.

Winged viviparous female: Large. The imagos on emerging from the pupae are first of a delicate gray, afterwards they become green, warm reddish, ginger brown or flesh-color. All forms are hoary. The ocelli are

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distinctly marked. A dark patch behind the head. The thoracic lobes are somewhat linear in form and dark brown like the scutellum. Abdomen with a faint green dorsal stain and green patches at the base of the nectaries. Wings hyaline, with green insertions and brown cubitus and stigma. Other veins coarse and black. Cauda pointed and green. The young are very delicate in tint, shading off from white to flesh-color, to pink, and to yellow. They are often prettily spotted about the head with rose color. They run very fast and are much more active than the adult insects. Length of body 2.54 mm.

My insect does not quite agree with Buckton's description and feeds on a different plant. I think the difference is enough to justify a varietal name at least, and it may be known by the following one.

93. **Siphonophora carnosa** var. **impatientis** n. var.

This form differs from the species in the following respects:

Apterous viviparous female: As in the species but with tail pale.

Pupa: Similar to the species except that the wing pads are whitish.

Winged viviparous female: Differs in having no dark patch behind the head; thoracic lobes but very little if any darker than the remainder of the body, and the abdomen with no green markings. Honey tubes reaching to tip of abdomen, dusky to black.

On upper branches and leaves of wild touch-me-not (*Impatiens fulva* and *I. pallida*). Ashland, October 5, 1889; Wabash, August 22, 1890.

Cotypes in the collection of the University of Nebraska (nos. 127, 128, 129) and of the U. S. National Museum (no. 18).

94. **Siphonophora chrysanthemi** Oestlund.

Oestlund, List Aph. Minn., p. 22 (1886).

Oestlund, Syn. Aph. Minn., p. 84 (1887).

Apterous viviparous female: Color varying from dark brownish green to almost black. Antennae on medium sized frontal tubercles, about three fourths as long as the body, black, with III and base of IV paler; VII longest. Legs rather short, dusky yellow, with joints, tips and tarsi black. Dorsum with a few very small black tubercles. Honey tubes about 0.30 mm. long, black, imbricated. Tail yellowish, about half as long as the honey tubes.

Winged viviparous female: Head and thorax dark brown to black. General color dark brownish green to almost black. Prothorax with sides

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drawn out into an obtuse angle, and a black line on its front edge. Beak reaching middle coxae. Eyes dark red. Wings with yellowish insertions, subcostal and stigma, the latter rather long and pointed and angled at base of stigmal vein; oblique veins slender and brownish. Abdomen broad, with marginal spots of black. Honey tubes as in apterous female but rather slenderer and longer. Tail half as long as honey tubes, robust, upcurved, yellowish. Length of body 2.40 mm., to tip of wings 4 mm.

On bur marigold (*Bidens connata* and *B. chrysanthemoides*), generally along the upper leaves and flower stalks. Lincoln, Weeping Water, October, 1888; Ashland, October, 1890. Most of the winged individuals have the legs all black but base of femora. This species has much of the appearance of an *Aphis* but has the honey tubes and tail and frontal tubercles of *Siphonophora*. It is very close to several of the European species on Composites.

Specimens in the collection of the University of Nebraska (no. 130) and of the U. S. National Museum (nos. 9, 349).

95. **Siphonophora chrysanthemicolens** n. sp.

Apterous viviparous female: General color dark seal brown to a purplish black, often with a very distinct coppery tinge. Head, prothoracic segment, all the antennae but the basal two thirds of III, honey tubes, tail, anal plates, coxae, distal half of femora, both ends of tibiae and tarsi deep shining black. Basal two thirds of III dusky; proximal half of femora and middle portion of tibiae yellowish. Antennae about as long as the body, on distinct, medium sized frontal tubercles; III and VII subequal, the former with a few small circular sensoria, the latter minutely annulate. I and II very robust. Eyes black. Beak reaching to or beyond the hind coxae. Abdomen carinated. Honey tubes much larger at the base than at the tip, 0.44 mm. long. Tail as long as honey tubes, very robust, upcurved, hairy. The whole insect, especially its legs, head and the base of the antennae covered with long black hairs. Length of body about 2.40 mm.

On upper part of stem and leaves of chrysanthemum in greenhouse at Omaha, January 16, 1891. Lincoln, Brookings, S. D., Minneapolis. A small, well characterized species, having much the appearance of an *Aphis,* but the legs are long and the frontal tubercles and tail place it in Siphonophora. It is easily recognized by its shining black markings, large tail and rather short,

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robust honey tubes. The insects are very lively and drop quickly from the plants when disturbed.

Cotypes in the collection of the University of Nebraska (nos. 131, 132) and of the U. S. National Museum (nos. 7, 149).

96. **Siphonophora desmodii** n. sp.

Apterous form: General color yellowish green. Antennae longer than the body; I, II and III dusky, remaining joints black. Head very slightly dusky. Eyes red. Abdomen yellowish green. Legs very long, especially the hind pair; yellowish, joints and tarsi dusky to black. Honey tubes black, largest at base and tapering gradually to the tip, annulated. Tail concolorous with abdomen, as long as the honey tubes (0.35 mm.), acute.

Winged form: General color as in apterous form. Antennae longer than the body, black, or with I and II brown and III paler; VII longest, IV next, it being longer than III; II is also long in comparison to the rest. Head dusky. Eyes red. Neck and prothorax yellowish green. Thorax dusky, with yellowish green membrane. Wings with remarkably clear texture and heavy dark subcostals; first and second discoidals very straight and with smoky black margins, second discoidal starting equidistant from the first and third; cubital subobsolete at base, arising from the subcostal opposite the stigma, one sixth of the way from its inner end, the second branch very near the apex of the wing, or sometimes wanting entirely or represented by a thickening at the end of the first branch. Stigma dusky brown. Stigmal vein curved for the first half, then almost straight. Abdomen yellowish green, with brownish spots around the base of the honey tubes. These latter and the tail as in apterous form. Length of body 2.36 mm., to tip of wings 3.30 mm. This species is sparsely covered with capitate hairs which are thickest on the legs and antennae.

On under side of leaves and along the flower stalks of *Desmodium canescens*. West Point, July 29, 1890 (Bruner); Weeping Water, August 16, 1890. It causes the leaves to curl. A very pretty species having some characters not usually found in this genus, as the smoky borders to the veins; but I do not think this is sufficient reason for removing it from the genus, since all the other characters are those of *Siphonophora*.

Cotypes in the collection of the University of Nebraska (nos. 133, 134, 135) and of the U. S. National Museum (nos. 10, 11).

97. **Siphonophora erigeronensis** Thomas.

Thomas, Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 7 (1878).
Thomas, Ins. Ill., 8th Rep., p. 58 (1879).
Oestlund, Syn. Aph. Minn., p. 82 (1887).

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Apterous viviparous female: Pale green. Antennae on large frontal tubercles; I, II and base of III pale, remainder black; III and VII subequal in length. Eyes black. Beak reaching to hind coxae. Legs long, with joints and tarsi blackish. Abdomen clear green. Honey tubes long (0.96 mm.), curved, imbricated, dusky to black. Tail yellowish green, not half the length of the honey tubes, hairy, acute.

Winged viviparous female: General color as in apterous form. Head and thorax of a darker, shining green. Antennae with more black than in apterous, III with numerous very small, scattered sensoria, otherwise similar. Beak as above. Legs black except the bases of femora. Wings hyaline, delicate, oblique veins very slender; cubital obsolete at base. Stigma conspicuous, dusky, rather acute at both ends, angled at base of stigmal vein, the latter sharply curved for two thirds its length, then nearly straight. Length of body about 2.50 mm., to tip of wings 3.90 mm. Honey tubes rather slenderer than in the apterous, imbricated, about 0.70 mm. long. Tail slender, upcurved.

On "cow tail" (*Erigeron canadensis*), in very large colonies. Lincoln, October 2, 1888; Weeping Water, October 10, 1888.

Specimens in the collection of the University of Nebraska (no. 136) and of the U. S. National Museum (no. 12).

98. **Siphonophora eupatorii** n. sp.

Apterous viviparous female: General color greenish or reddish brown. Antennae one and one half times as long as the body, brown to black. Legs brownish, with black joints and tarsi. Honey tubes twice as long as the tail; both shining black.

Winged viviparous female: Greenish to brown, head and lobes of thorax olive brown. Antennae one and a half times the body, black. Beak reaching hind coxae, black, with paler base and whitish rings at the articulations. Legs black, except femora. Wings with yellowish insertions and slender veins; the second branch of cubital very near the apex of the wing and in many specimens entirely wanting or represented by a thickening at the end of the vein. Stigmal vein curved only at the base, then straight or slightly recurved. The venation is very variable. Honey tubes and tail as in apterous female.

On white snakeroot (*Eupatorium ageratoides*), in company with *Aphis ageratoides* Oestlund, October, 1889. Apterous females and pupæ of a *Siphonophora* very close to, if not identical with the above, were collected September, 1890, on *Eupatorium perfoliatum* at Ashland not far from the place where that species was collected, differing only in being of a more uniformly greenish-

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brown color and having the tail concolorous with the abdomen. Length of body, 1.75–2.00 mm.; antennae, 2.90 mm.; honey tubes, 0.40 mm. The species has affinities with *Myzus*.

No specimens in either collection.

99. **Siphonophora euphorbiae** Thomas.

Thomas, Bull. Ill. St. Lab. Nat. Hist., 2, p. 6 (1878).

Thomas, *l. c. Siphonophora euphorbicola.*

Apterous viviparous female: General color pale green. Antennae longer than body; lower portion pale, apical portion dusky. Eyes black. Legs pale. Tarsi dusky. Honey tubes pale with dusky tips.

Winged viviparous female: General color bright green. Head and thoracic lobes brownish. Antennae considerably longer than body; black, with pale base. Wings large, hyaline, with yellowish insertions and subcostal, prominent but slender oblique veins; second branch of cubital arising nearer the apex of wing than to base of first branch; stigma dusky; stigmal vein curved nearly or quite its entire length. Honey tubes long and slender, dusky at tip, fully three times as long as the tail. Tail green, upcurved.

On spurge (*Euphorbia hypericifolia*). Ashland, October 9, 1889. Generally few in number and clustered on under side of leaves and on flower stalks. It is very probable that both of Thomas's species are the same thing. My specimens agree with the descriptions of both species and though his description of *S. euphorbicola* is the better one, having colors given, the specific name *euphorbiae* must be used as it precedes the other in his article.

100. **Siphonophora frigidae** Oestlund.

Oestlund, List Aph. Minn., p. 20 (1886).

Oestlund, Syn. Aph. Minn., p. 83 (1887).

Apterous viviparous female: Color shining dark green. Eyes black. Antennae on large frontal tubercles, as long as the body, black, with base of III paler; VII and III subequal in length. Beak reaching middle coxae, blackish. Legs black, with bases of femora paler. Dorsum tuberculate, hairy. Honey tubes imbricated, black.

Winged viviparous female: Head and thorax black. Antennae about as long as body, black, with base of III paler; III longer than VII, III and IV with sensoria. Beak rather long. Abdomen shining dark green, with a distinct metallic luster, hairy. Honey tubes black, imbricated, 0.50 mm. long. Tail black, obtuse, hairy, 0.35 mm. long. Length of body 2.35 mm., to tip of wings 4 mm.

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On *Artemisia frigida.* War Bonnet Canyon, June 23, 1890. Oestlund mentions his having found both apterous and winged males in this species. I was not able to find either, but the species was not very plentiful and I did not get many specimens, which probably accounts for it, and then it was rather early in the season also.

Specimens in the collection of the U. S. National Museum (no. 15).

101. **Siphonophora fulvae** Oestlund.

Oestlund, Syn. Aph. Minn., p. 80 (1887).

Apterous viviparous female: Green. Very thickly pulverulent, causing it to appear nearly white. Legs, honey tubes and the lower third of antennae pale; tarsi, tips of honey tubes and outer two thirds of antennae dusky to black. Tail rather small, pale.

Winged viviparous female: Head and thorax dark green to brown. Antennae longer than body, more or less dusky; III shorter than VII, IV and V subequal. Beak reaching beyond second coxae, 0.40 mm. long. Abdomen pale green. Honey tubes rather short, dusky to black. Tail stout, pale, equaling the honey tubes in length, 0.23 mm. long. Length of body 2.50 mm., to tip of wings 4.25 mm.

Found on the upper branches and leaves of the wild touch-me-not (*Impatiens fulva* and *I. pallida*) in company with *Siphonophora carnosa* var. *impatientis.* Ashland, October 5, 1889; Wabash, August 22, 1890.

Specimens in the collection of the University of Nebraska (nos. 137, 138, 139).

102. **Siphonophora gaurae** n. sp.

Apterous viviparous female: Pale yellowish green, shining. Antennae about the length of the body, on very large frontal tubercles, pale, with the tips of III, IV and V and all of VI and VII black; III and VII subequal. Eyes red. Beak reaching nearly or quite to hind coxae. Legs of medium length, pale, with femoral tips dusky and tibial tips and tarsi black. Honey tubes reaching beyond tip of abdomen, but not beyond tip of tail, 0.75 mm. long, pale, with dusky tips. Tail half the honey tubes in length, robust, hairy, pale yellowish. Length of body 3.25 mm., outline elongate ovate.

Pupa: Color as above. Legs, antennae and honey tubes shorter. Tail conical. Wing-pads pale green.

Winged viviparous female: Pale greenish yellow. Head and thorax pale

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olive. Eyes red. Antennae somewhat longer than the body, olive brown, with tips of III, IV and V and all of VI and VII black; VII longer than III, the latter with sensoria. Legs as in the apterous form. Honey tubes and tail more slender and not quite so long, otherwise similar. Wings delicate, with pale yellowish subcostal, dusky yellowish stigma, prominent blackish brown oblique veins. Stigmal curved gradually its entire length. Cubital nearly or quite obsolete at base; second branch originating equidistant from the apex of wing and the first branch. Length of body 3–3.40 mm., to tip of wings 4.50 mm.

Found very plentifully on *Gaura parviflora,* at Ashland, July–October, 1890. The green species of this genus are very hard to define. This species is similar to *S. pisi* and *S. pelargonii,* but differs in its shorter antennae, legs and honey tubes, the prominent discoidals and the color markings of the limbs. It was watched very closely during the season, and these characteristics were found to be constant.

Cotypes in the collection of the University of Nebraska (no. 140).

103. **Siphonophora gaurina** n. sp.

Apterous viviparous female: Broadly ovate. Head small, pinkish flesh-color, whitish pruinose. Antennae on rather small frontal tubercles, hardly reaching to base of honey tubes, pale, tips of III and IV dusky; tip of V and all of VI and VII black; III a little longer than VII. Eyes red, with a very small brown tubercle. Beak reaching beyond the middle coxae. Legs short, tibial tips and tarsi black. Honey tubes not reaching to tip of abdomen (0.60 mm.), slender, larger at base, pale, with slightly dusky tips. Tail yellowish, three fourths the length of the honey tubes, rather slender, hairy. Length of body, 4 mm.

Pupa: Similar in every respect, except that the size is much smaller and the tail conical. Wing-pads whitish.

On *Gaura parviflora.* Ashland, September, 1890. This, in general appearance, is somewhat like *S. carnosa* Buckton. It is very different from that species, however, when studied closely; and, although found together with *S. gaurae,* is plainly specifically distinct from that species. It is much larger, of a different shape and much quicker in its movements than that species.

Cotypes in the collection of the University of Nebraska (no. 141) and of the U. S. National Museum (nos. 17, 397).

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104. **Siphonophora grindeliae** n. sp.

Apterous viviparous female: Pale pea green, no darker markings on the body. Eyes dark red. Antennae all pale, about the length of the body, III longest, IV and VII subequal. Beak only reaching to middle coxae. Legs all pale but tips of tarsi. Honey tubes long, reaching beyond the tip of the abdomen, slightly swollen just below the tip, pale green. Tail robust, about one third of the honey tubes in length, obtuse, hairy. The embryos can be seen very plainly in the abdomen of the female; their eyes appear almost black.

Pupa: Color as in the apterous form, but the antennae shorter than the body, with the tips of each joint and all of VI and VII dusky and VII as long as or slightly longer than III. Beak not reaching to middle coxae. Legs with the tarsi and tibial tips dusky. Wing-pads and thorax darker green. Honey tubes as in above. Tail short and conical.

Winged viviparous female: Color, eyes and tail as in apterous form. The honey tubes similar except that they are dusky toward the tip. Antennae longer than the body, blackish, pale at base; III longest and with sensoria. Beak only reaching to or slightly beyond the middle coxae. Legs pale, with dusky tibial tips and tarsi. Wings with slender brownish veins, subcostal pale yellowish; stigma grayish; cubital with branches varying. Stigmal vein sharply curved for the first half, then straight or slightly recurved. Length of body 2.55 mm., to tip of wings 4.40 mm., honey tubes 0.70 mm.

This is between *Siphonophora rubi* and *S. pelargonii,* having the size of the latter and the honey tubes of the former, and similar to both in color. It is similar in appearance to *S. pisi,* but differs in honey tubes and antennae as well as in the thoracic coloration.

On *Grindelia squarrosa.* Lincoln, May, 1889, and June, 1890. Cotypes in the collection of the University of Nebraska (no. 142) and of the U. S. National Museum (no. 396).

105. **Siphonophora ludovicianae** Oestlund.

Oestlund, List Aph. Minn., p. 23 (1886).

Oestlund, Syn. Aph. Minn., p. 80 (1887).

Apterous viviparous female: Yellowish green, pulverulent. Eyes bright red. Antennae on large frontal tubercles, longer than body, black, with paler base; III and VII subequal in length, the former with a few sensoria. Beak reaching hind coxae, only the last joint black, acute. Legs black, with proximal two thirds of femora yellowish. Honey tubes black, pale at base, 0.55 mm. long. Tail robust, upcurved, almost as long as honey tubes, yellow. Length of body 2.80 mm.

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Winged viviparous female: Color as in apterous female, but with less pulverulence and head and thoracic lobes brown to black. Eyes dark red. Beak as in apterous, but more of it black. Antennae much as in apterous, only more shining black, rather longer, and III with more and larger sensoria. Wings with yellowish insertions, subcostal and stigma, the latter rather long and pointed; oblique veins slender, brownish; cubital obsolete at base. Legs, honey tubes and tail as in apterous female, but the two former with rather more black. Length of body 2.45 mm., to tip of wings 4.40 mm.

On *Artemisia ludoviciana.* Ashland, Lincoln, Fremont, June–October. Always in very small colonies or solitary, on the upper leaves and among the flowers.

Specimens in the collection of the University of Nebraska (nos. 143, 144) and of the U. S. National Museum (no. 399).

106. **Siphonophora luteola** n. sp.

Apterous viviparous female: Almost linear, very bright shining yellow. Antennae twice as long as the body, on medium sized frontal tubercles; shining black, with yellowish base; III with a few scattered sensoria, shorter than VII. Eyes black. Head broad. Beak reaching hind coxae, obtuse, apical third black. Legs robust, long, pilose, proximal two thirds of femora yellow, rest all black. Honey tubes dusky at base, growing blacker towards the tip, 0.80 mm. long. Tail robust, upcurved, yellow, about 0.50 mm. long. Length of body 2.10 mm.

Pupa: Very similar but with members generally shorter and paler. Wing-pads concolorous with abdomen.

A very pretty species found on golden rod (*Solidago missouriensis*). Ashland, September 20, 1890. In small colonies on the upper leaves and flower stalks. It is similar to *S. ludovicianae* Oestlund in some respects, but has longer antennae, black eyes and none of the characteristic mealiness of that species, besides being of a very bright yellow color.

Types in the collection of the U. S. National Museum (no. 398).

107. **Siphonophora menthae** Buckton.

Buckton, Mon. Brit. Aph., I, p. 120, pl. IX, figs. 1, 2 (1876).

Thomas, Ins. Ill., 8th Rep., p. 68 (1879).

Apterous viviparous female: Long oval, narrow at the head, very broad at middle of abdomen. Lively green, transparent and often permitting the eyes of the embryos within to appear as red specks. Abdomen usually exhibits delicate lines, as if they were the sutures of horny plates. An-

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tennae very long, slightly olive at the tips. Frontal tubercles very large and slightly gibbous. Eyes red. Head, thorax and abdomen consolidated and without perceptible separation. Honey tubes cylindrical, greenish and black at tips. Legs long, hirsute; genua olive; tarsi black; tail green. Size of body 2.02 by 1.01 mm.

Winged viviparous female: Bright green. Antennae dark olive, the two basal joints green. Eyes red. Thoracic lobes and scutum olive. Abdomen carinated, with four dark spots within the folds. Honey tubes fine and black. Legs green, hardly so long as those of the larva. Tarsi black, the gibbous character of the basal joints of antennae less marked. Wings with pale brown subcostal and stigma. Some specimens show disjointed transverse bars on the abdomen. Size of body 1.52 by 0.62 mm. Honey tubes about 0.50 mm. long. Antennae in both forms much longer than the body. (After Buckton.)

On wild mint (*Mentha canadensis*). Weeping Water, October 11, 1888.

108. **Siphonophora muralis** Buckton.

Buckton, Mon. Brit. Aph., I, p. 157, pl. XXVI (1876).

Apterous viviparous female: Body ovate, hairy. Color a rich chestnut brown. Antennae longer than body, black, with pale base; III longest, longer than IV, V and VI together, very thickly covered with sensoria, hairy. Eyes reddish brown. Beak reaching hind coxae. Legs very long, yellowish, with distal ends of femora, the tibial tips and tarsi black. Honey tubes tapering, black, 0.55 mm. long. Tail slender, acute, about three fourths the honey tubes, yellow.

Pupa: Similar, but with antennae, tail, honey tubes and legs shorter, and body generally smaller.

Winged viviparous female: Smaller and more linear than the apterous female. Antennae blacker and III with more sensoria. Head and thorax dark brown. Legs with a greater proportion of black than in the apterous form. Wings large, with yellowish insertions and yellowish brown subcostal and stigma; oblique veins slender, light brown. Honey tubes and tail as in apterous form. The general color is like that of the apterous form, but of a darker brown, generally. Length of body 2.75 mm., to tip of wings 4.25 mm.

Winged male: Smaller than the winged female. Wings more delicate. Head and thorax but little darker than the abdomen, otherwise as in that form. Length of body about 1.75 mm., to tip of wings 3.75 mm.

On wild lettuce (*Lactuca* sp.) throughout the season for the last three years; very common. Ashland, Lincoln, Weeping Water, Wabash, Fremont. The difference in size between the

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various forms is not so great as in Buckton's specimens, but I am sure this is his species.

Specimens in the collection of the University of Nebraska (nos. 145, 146, 147) and of the U. S. National Museum (no. 395).

109. **Siphonophora pelargonii** (Kaltenbach).

Kaltenbach, Mon. Pflan., p. 21 (1843). *Aphis pelargonii.*
Koch, Die Pflan., p. 193, figs. 265, 266 (1854). *Siphonophora pelargonii.*
Buckton, Mon. Brit. Aph., I, p. 136, pl. XV (1876). *Siphonophora pelargonii.*

Apterous viviparous female: Bright pea green. Eyes red. Antennae and tarsi dusky, the former much longer than the body. Honey tubes very long and slender (0.65 mm.), green. Tail robust, upcurved, not half the honey tubes in length, green. Size about the same as the winged female.

Winged viviparous female: As in the apterous form, but legs and antennae darker. Head and two spots on prothorax dark green. Thoracic lobes light greenish olive. Wings delicate, with pale insertions and grayish stigma; the veins rather prominent, brownish; VII longer than III. Tarsi and tibial tips blackish. Beak not reaching the hind coxae, with a sharp black tip. Honey tubes and tail as in apterous form. Length of body 2.20 mm., to tip of wings 4 mm.

What I take to be the male was found on hollyhock at Ashland, November 1, though I found no oviparous females. Head, prothorax, thorax, antennae, legs (except base of femora) and honey tubes black. Wings very long, with brownish stigma. Abdomen greenish, with blackish brown spots on the dorsum. Tail rather short, acute, brownish. Length of body 2 mm., to tip of wings 4.60 mm.

On under side of leaves of hollyhock. Ashland, November 1, 1890. On leaves of skeleton geranium. Omaha, January 16, 1891. Although formerly supposed to be but a hothouse louse, this species is able to stand severe cold. It was found at Ashland after considerable snow had fallen. Buckton and Koch both noticed this also.

Specimens in the collection of the University of Nebraska (nos. 148, 149, 150) and of the U. S. National Museum (no. 287).

110. **Siphonophora pisi** Kaltenbach.

On clover in greenhouse. Lincoln, December 30, 1890, specimens nos. 151 and 152, University of Nebraska collection.

111. **Siphonophora rubi** (Kaltenbach).

Kaltenbach, Mon. Pflan., p. 24 (1843). *Aphis rubi.*

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Koch, Die Pflan., p. 191, figs. 263–4 (1854). *Siphonophora rubi.*

Buckton, Mon. Brit. Aph., II, p. 140, pls. XVII, XVIII (1876). *Siphonophora rubi.*

Thomas, Ins. Ill., 8th Rep., p. 64 (1879). *Siphonophora rubi.*

Winged viviparous female: Large, shining green, slightly pilose. Long oval. Head narrow. Antennae and legs long and green; the articulations of the former are slightly marked with black. Eyes reddish brown. Honey tubes long, curved and slightly thickened at their bases, then constricted; inflated at their midst, and finally expanded at their mouths. Tail large and hairy. Tarsi black. Length of body 3.30 mm., of honey tubes 1.27 mm.

Winged viviparous female: Very large, wholly green but rather redder on the thorax. Head with conspicuous red ocelli. Antennae nearly half as long again as the body, rest of insect like larva. Wings iridescent, with yellowish insertions, yellow subcostal and stigma; the whole insect slightly pilose. Length of body 3.04 mm., of honey tubes 1.01 mm.

Winged male: Green. Head very broad and black. Ocelli distinctly marked. Antennae very long. Back thorax and prothorax green, with black linear thoracic lobes and small scutellum. Abdomen very small, not equal to the length of the head and thorax together. Four or five transverse dark green dashes on dorsum. Honey tubes as in winged female. Legs disproportionately long. Tail small. Wings remarkably large. Stigma gray. From the under side the valves which support the penis can be easily seen. Some males are redder than the above. Occasionally the wings want the second cubital fork. Also the clavate character of the honey tubes is more marked in some specimens than in others. Length of body 2.54 mm., of honey tubes 0.50 mm.

Apterous oviparous female: Form oval or sac-like, drawn out towards the head. Green, slightly pubescent. Antennae and legs relatively longer in this sex than in the viviparous female, a remark which does not usually apply to other species. As the eggs approach maturity they appear like oval whitish masses under the skin. After deposition and exposure to the air they turn lustrous black. About 2.80 mm. long. (After Buckton.)

Found on cultivated raspberry. Lincoln, October 21, 1888. Only a few winged viviparous females and larvae were found, but they agree exactly with Buckton's description, so I am sure of the species. This is another of the species that show affinities to both *Siphonophora* and *Rhopalosiphum,* and is rather difficult to locate satisfactorily.

Specimens in the collection of the U. S. National Museum (no. 393).

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112. **Siphonophora rudbeckiae** (Fitch).

Fitch, St. Cab. Nat. Hist., p. 66 (1851). *Aphis rudbeckiae.*
Thomas, Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 4 (1878). *Siphonophora rudbeckiae.*
Thomas, Ins. Ill., 8th Rep., p. 49 (1879). *Siphonophora rudbeckiae.*
Oestlund, Syn. Aph. Minn., p. 85 (1887). *Siphonophora rudbeckiae.*

Apterous viviparous female: Very large. Bright red. Antennae about as long as the body, black, with paler base. Legs black, except the base of femora and upper half of tibiae; very long. Honey tubes very long, black. Tail over half the honey tubes in length, yellowish, the dorsum without the tubercles found on *S. ambrosiae* Thomas. Length 4–4.20 mm.

Winged viviparous female: General color red. Head and thorax a little darker. Antennae on large frontal tubercles, much longer than the body, black, paler at base; VII longer than III. Eyes black. Beak long, about as long as the honey tubes. Legs all black but the immediate base of femora. Honey tubes very long, 0.80–0.95 mm., cylindrical, shining black. Tail more than half the honey tubes in length, yellowish, upcurved and rather acute. Size somewhat smaller than the apterous female.

Very common throughout the season on *Silphium* sp., *Ambrosia* sp., and many other Compositae. There are several different color varieties. The one on *Silphium* and *Rudbeckia,* a bright red form, is considered to be typical. All of the red and brown forms on the composites are very closely allied.

Specimens in the collection of the University of Nebraska (no. 153) and of the U. S. National Museum (nos. 366, 377, 391).

113. **Siphonophora solidaginis** (Fabricius).

Fabricius, Ent. Syst., IV, p. 211 (1794). *Aphis solidaginis.*
Kaltenbach, Mon. Pflan., p. 32 (1843). *Aphis solidaginis.*
Koch, Die Pflan., p. 197, figs. 269, 270 (1854). *Siphonophora solidaginis.*
Buckton, Mon. Brit. Aph., I, p. 156, pl. XXV (1876). *Siphonophora solidaginis.*

Apterous viviparous female: General color bright red. Elongate ovate. Dorsum with regularly arranged rows of very small black tubercles, out of each of which proceeds a black hair. Front hairy. Antennae black, with pale base, pilose, on large frontal tubercles; III longest. Head brownish in many individuals. Eyes dark red. Beak reaching nearly or quite to hind coxae, dusky to black. Legs long; tibiae, tarsi and distal end of femora black, pilose. Abdomen arched, but segments generally well defined. Honey tubes rather long, tapering, then widening at tips, shining black, 0.60–0.80 mm. Tail about two thirds the honey tubes in

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length (0.50 mm.), rather acute, hairy, upcurved, dusky to almost black. Length of body 3 mm.

Pupa: Smaller, lighter colored, antennae and legs shorter. Wing-pads blackish.

Winged viviparous female: Slightly larger than the apterous female. Bright red. Head and thorax shining black. Antennae longer than body, colored as in apterous female. Abdomen without tubercles, pointed behind. Honey tubes, legs and tail as in apterous female but generally with more black. Wings with yellowish insertions, costal and subcostal; stigma dusky gray, very long, acutely pointed; oblique veins slender and brownish.

Winged male: Smaller than winged female. Head and thorax shining black. Antennae very long, black, on rather small frontal tubercles. Wings very large, branches of cubital and stigmal coming very close together and running almost parallel, otherwise as in female. Legs with more yellow. Abdomen small, with brown marginal spots and irregular markings on the dorsum. Honey tubes and tail as in female, but smaller. Length of body 2.40 mm., to tip of wings 4.50 mm.

On leaves and flower stalks of golden rod (*Solidago* sp.). Very plentiful at Ashland during the later summer and autumn months. Distinguished from *S. rudbeckiae* by its movements and tuberculate dorsum, and from *S. ambrosiae* by its color and black head and thorax.

Specimens in the collection of the University of Nebraska (nos. 154, 155) and of the U. S. National Museum (nos. 288, 387, 388).

114. **Siphonophora verbenae** Thomas.

Thomas, Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 8 (1878).

Thomas, Ins. Ill., 8th Rep., p. 63 (1879).

Apterous viviparous female: Elongate oval. Bright pea green, generally with a median stripe of darker green and more or less distinct marginal stripes. Antennae about the length of the body; I, II and most of III pale, apex of III and the remaining joints dusky to black. Eyes red. Legs very long, pale, with dusky to black tibial tips and tarsi. Honey tubes long, slender, green, with dusky tips. Tail half the honey tubes in length, green.

Winged viviparous female: Green. Head, two basal joints of antennae and thoracic lobes olive brown. Eyes red. Antennae longer than the body; all black but a very small part of the base of III and the two basal joints; VII rather longer than III, the latter tuberculate. Beak reaching to or slightly beyond middle coxae. Wings with pale yellowish insertions, slender brownish veins, grayish stigma and venation variable. Legs dusky, with whitish femoral bases, black femoral and tibial tips and tarsi, hairy,

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especially the tibiae. Honey tubes green to dusky. Tail shorter than in apterous form, more slender and acute, green to slightly dusky. Length of body 2.40 mm., to tip of wings about 4.50 mm., of honey tubes 0.60 mm.

On *Verbena stricta.* Lincoln, October 16, 1888, at which time only an apterous form was found. On *Verbena* sp. in greenhouse, Lincoln, January 12, 1891.

I am not sure that this is Thomas's species; it differs in a few points, but as he had only immature specimens his description is not very complete, and that can account for all the differences. The young apterous forms agree with his specimens.

Specimens in the collection of the University of Nebraska (no. 156) and of the U. S. National Museum (no. 390).

Genus **Phorodon**

115. **Phorodon cynoglossi** n. sp.

Apterous viviparous female: Pale green, with tips of antennae, tarsi and tips of honey tubes black. A median stripe of a reddish tinge. Eyes very dark red. Front with short capitate hairs. Antennae on toothed tubercles and with I gibbous on inner side.

Pupa: As in apterous form, but with a band of dark green on each side of the abdomen and with the posterior two thirds of the reddish median stripe replaced by dark green (sometimes the median stripe is all green). Tail short and conical and an irregular dark green band at base of each wing-pad; wing-pads pale, with tips sometimes dusky. The margins of the prothorax projecting out so as to appear almost as if with lateral tubercles.

Winged viviparous female: Head, thorax and prothorax dark olive brown. Head more or less pointed in front. Antennae with two basal joints and tips brown, rest pale; III and VII subequal; III tuberculate; all joints more or less annulated; on distinctly toothed tubercles, and with I gibbous. Neck green. Sides of thorax and wing insertions yellowish. Wings delicate; veins slender but well defined; subcostal rather heavy. Oblique veins all more or less curved; cubitus with second branch nearer the first than to the apex of the wing; in some specimens it is very much nearer. Stigma dusky, long, very obtuse at inner end and acute at outer. Stigmal vein heavy and very sharply curved for its entire length. Legs pale to dusky, with blackish femoral and tibial tips and tarsi. Abdomen greenish, with a double row of brown marginal spots, a large irregular, subquadrate, dorsal spot of light olive brown and various irregular greenish or brownish markings over the dorsal surface. In some individuals the reddish tinge on the anterior portion of the abdomen can be noticed

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as in the pupae. Honey tubes reaching to tip of abdomen, clavate, brown. Tail short, slender, acute and brown. Length of body 2 mm., to tip of wings 3.75 mm.

When first noticed only the apterous females and pupae could be found. On January 5 the first winged individuals appeared. The species is close to *P. galeopsidis* (Kalt.), but differs in coloration, in venation of the wings, in color and shape of stigma, in shape of stigmal vein, and in the arrangement of the markings on the abdomen, besides feeding on a plant of an entirely different order. On forget-me-not (*Cynoglossum* sp.) in the greenhouse of the botanical department of the State University, December, 1890, to January, 1891.

Cotypes in the collection of the University of Nebraska (nos. 157, 158, 159) and of the U. S. National Museum (nos. 141, 142).

116. **Phorodon monardae** n. sp.

No description. Type from Ashland, May 24, 1890, on *Monarda festulosa,* in collection of University of Nebraska, no. 160.

117. **Cryptosiphum canadensis** n. sp.

Apterous form: Pale green. Antennae nearly as long as the body, with a few scattered hairs; VII about two and one half times VI; pale, with the last half of IV, V, VI and VII black. Front with a few long stiff hairs. Legs short, the femoral and tibial tips and tarsi black, rest paler. Eyes black. Honey tubes and tail wanting. Length of body 2.40 mm.

Winged form: Smaller than the apterous form. Head, thorax and antennae black. Antennae on rather inconspicuous frontal tubercles, widely separated at base, as long as body; VII at least three times VI; with fewer hairs than apterous form. Front with stiff hairs. Eyes black. Beak reaching middle coxae. Legs more or less hairy, colored as in apterous form. Wings with yellowish insertions, slender, dusky veins and broad dusky stigma. Abdomen dark green, apex hairy. Honey tubes represented by small pores. Tail hardly noticeable. Length of body 1.90 mm., to tip of wings 2.95 mm.

On *Artemisia canadensis.* War Bonnet Canyon, June 24, 1890, and on *Art. ludoviciana,* Fremont, July 31, 1890. It is found on the under side of the leaves and on the stem. It causes the leaves to curl up more or less. It is easily distinguished from *C. artemisiae* Buckton, the only other species in the genus, by its color, longer antennae and legs and much longer seventh antennal joint

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and lack of mealy substance in all forms. It is very agile and when disturbed runs away rapidly and hides itself.

Cotypes in the collection of the University of Nebraska (nos. 161, 162) and of the U. S. National Museum (nos. 36, 37, 148).

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UNIVERSITY STUDIES

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TRADE AND THE FLAG

BY MINNIE THROOP ENGLAND

Present colonization is undertaken and supported almost wholly from economic motives,[1] chief among which is the wide-spread and oft-spoken belief that colonies furnish a peculiarly favorable field to the governing country for the development of trade and commerce. An inquiry into the real support which the present colonial trade gives to that belief should not be fruitless.

Formerly the word "colony," in popular usage, meant the same as that which is now termed a settlement colony. The acquisition of land unfit for settlement purposes has made it necessary, however, to expand the meaning of the term to include commercial and plantation as well as settlement colonies. In its broad sense, therefore, a colony may be defined as an outlying possession under a different administrative system from that of the mother country.

But even after defining a colony in simple terms the application of the definition is difficult. Nominally Egypt is a Turkish possession; in reality it is in all essentials a British colony. Which is its mother country? Again, the westward expansion of the United States and the eastward expansion of Russia in adjacent territory present all the characteristic features of colonization, yet, since the territory has been absorbed by the mother country

[1] Economic motives are predominant in other lines also as well as in colonization. Ireland (*China and the Powers*, 4) says that at "the present day the political action of nations is determined almost entirely by economic considerations."

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instead of retaining its identity, it falls outside of the hard and fast lines of the definition. Finally, there are outlying possessions under the same administration as the mother country, yet which it seems best to consider as colonies. For example, Algeria is treated as part of France, and for administrative purposes the Canary Islands are regarded as part of Spain, yet they are essentially colonial in character.

There are at the present time fifteen countries which possess colonies. The eight which control the largest territories are—naming them in order—the United Kingdom, France, China, Germany, Belgium, Portugal, the Netherlands, and the United States.

The figures involved in discussing colonial areas and populations are so large that they convey little of their real meaning. The United Kingdom ranks first as a colonizing power both in the number of square miles occupied and the number of people governed, and France takes second place. Germany entered the race late but has succeeded in securing control of more than a million square miles, a territory five times as large as the German Empire. The sole Belgian possession, Congo Free State, represents a vast territory in Central Africa which, because of its unique position of responsibility to one man[2] instead of to a nation and because of the avidity with which it has been exploited, has been kept in the forefront of popular discussion. Russia's fondness for acquiring territory is well known, yet since its expansion is chiefly adjacent and rapid absorption follows, Russia has, strictly speaking, only two dependencies to be considered, Bokhara and Khiva. China's hold over her possessions is more or less nominal. They comprise Manchuria, Mongolia, Tibet, and Chinese Turkestan.[3] Japan stands near the foot of the list in extent of colonial territory, yet her evident imperialistic ambitions have given her a prominent position among colonizing nations, and incidentally put a check upon the attempted dismem-

[2] The death of King Leopold II removes this distinction.

[3] The province of Chinese Turkestan is officially called Sin-chiang or the New Dominion. Deasy, *In Thibet and Chinese Turkestan*, 328; see also *Statesman's Year-Book*.

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berment of China by the western powers. Spain is a declining colonial power, yet she still controls about 80,000 square miles—enough territory to make half a dozen Formosas. Turkey, too, through misrule, sees its possessions slipping away entirely or retained only nominally. Since Bulgaria declared independence there remain but Egypt, Samos, Crete, and Anglo-Egyptian Soudan. Austria-Hungary took the occasion of the recent Balkan troubles to declare her occupation of Bosnia and Herzegovina permanent, a move which did not occasion great surprise, however. Since the decline of the Danish West Indies, Denmark's most prosperous colony is Iceland. The Dutch, by their work in Java, have attracted much criticism both adverse and favorable. Portugal, like some of the other colonizing nations, seems to be more successful as a colonial exploiter than as a developer of colonies.

The fact that the colonizing nations expect to reap some economic gain, especially in the line of trade, from their possessions, makes the question "Does trade follow the flag?" ever a timely one. But in order to determine whether any part of the commerce between the mother country and its colony, aside from tariff-controlled trade, is due to their political relations, a consideration in some detail of the main factors influencing the movements of goods is necessary. Some general propositions regarding trade are, therefore, presented.

Trade, if not interfered with, follows the *price list.*[4] Efficiency and economy of industrial production are more and more recognized as the chief factors in expanding trade. An English writer gives as his view of the causes of American success in trade the fact that, in the first place, an American is not content with one thriving business but will speculate in another enterprise or even twenty, and greater risks mean greater opportunities for gain. An English firm has been known to refuse to book orders because it had enough work for two years ahead; an American firm would have risked an extension of plant and continued taking orders. In the second place, an American will sell at a loss to create a

[4] *Cf.* Farrer, "Does Trade Follow the Flag?" in *Contemporary Review,* 74: 832.

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market, and trust to gradually increasing the price until it is remunerative. Finally, the American business man is quick to pick out the efficient man in his business and promote him, while the Englishman is liable to allow prejudices of castes, nationalities, precedents, or family connections to influence promotions at the expense of efficiency. Van Cleave,[5] on the subject "What Americans must do to make an Export Business" says: "We must make better goods than our European competitors. We must improve our methods so that we can sell those goods as cheaply as our competitors sell inferior goods, or cheaper. We must do this notwithstanding the lower prices which Europe's employers pay for labor. . . . We must equip our laborers to do more work than the Europeans do in the same length of time, and do it better.

"To this end we should establish manual training departments in all our public schools, in which boys, beginning at the age of ten or eleven, could learn to handle all the tools used in the ordinary mechanical trades, and we should provide trade high schools in which boys who pass through the manual training branch of the primary schools could become first-class mechanics."

Again, trade is unquestionably influenced by the *geographical position* of countries.[6] Canada, for example, gets about 70 per cent of her imports from sources outside of the British Empire, and the larger part of this, or 56.7 per cent of the total imports, comes from the United States.[7] Nor does trade in the West Indies follow the flag, but continually drifts towards its natural market the United States.[8] It is well recognized by European countries that the geographical position of the United States gives that country an advantage over them in West Indian, Mexican, South American, Canadian,[9] and also Asiatic trade. For the same

[5] Annals of the American Academy of Political and Social Science, 29: 34–35.

[6] *Cf.* Flux, "Flag and Trade," in *Journal of the Royal Statistical Society*, 62: 524. Caillard, "An Empire in the Making," in *Monthly Review*, 18: 43.

[7] Caillard, *op. cit.*, 38.

[8] *Cf.* Bigelow, *Children of the Nations*, 305–306.

[9] *Cf.* Root, *Trade Relations of the British Empire*, 60–61.

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reason—geographical situation—the United States secures the larger part of French Tahiti's trade;[10] although the trade of the Society Islands with the United States was somewhat less in 1906 than in 1905, owing to the San Francisco earthquake, yet 48 per cent of the imports were drawn from the United States, and 44 per cent of the exports went thereto.[11] Japan's geographical position in turn gives her an advantage over her western rivals, in trade as well as in strategic position.[12] Formosa's trade with China is larger than with any other foreign country,[13] for though the island is politically Japanese, it continues commercially Chinese, since, according to Parker, 95 per cent of the trade is either with the mainland or with Honkong.[14] Later returns, however, show that part of the Formosan trade with China is being transferred to Japan.[15]

The strength of *custom* as a factor in trade[16] is well shown in German Southwest Africa. The natives there had been accustomed to buy of the English, and the early German traders found it necessary, in order to sell their goods, to substitute English trade marks for their own.[17] The strength of the hold of custom, however, varies according to the temperament of people. The restless spirit, such as we find in the United States, buys, now here and now there, always in the hope of betterment.

[10] *Cf. Statesman's Year-Book,* 1903, 640.

[11] Dreher, "Society Islands," in *U. S. Consular Reports,* September, 1907, 103.

[12] *Cf.* Stead, *Great Japan,* 204; Stead, *Japan To-day,* 231.

[13] *Cf.* Colquhoun, *Mastery of the Pacific,* 395.

[14] Parker, *China,* 142.

[15] "A change has already taken place in that the Japanese goods which have hitherto been imported through Hong Kong and Amoy, now come direct from Japan, and many of the exports to foreign countries are now sent by way of Japan. The natives, who used to wear clothes of Chinese manufacture, and live on food grown in China, are now beginning to use Japanese manufactures. The trade relations between Formosa and Japan are becoming closer and closer."—Takekoshi, *Japanese Rule in Formosa,* 271–272.

[16] *Cf.* Parkin, *Imperial Federation,* 290.

[17] *Cf.* Keller, *Colonization,* 569.

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The *size of the buyer's pocket book* affects trade. A poor country will not buy the same kind nor the same quantity of goods as a richer country. In making goods for such peoples as the Chinese, the manufacturer, in order to be successful, must continually bear in mind the extreme poverty of the people.[18] In the African Mediterranean States, also, the chief desideratum in purchasing goods is cheapness, and the Germans, recognizing this fact, have been very successful in establishing trade there.[19]

The *character of the salable products* also helps determine the direction of trade. The French carry on a large trade with their older colonies, which have the larger part of the French settlers, but in their new territory in Asia and Africa, they have only a small portion of the trade. The reason for this is that French manufacturers do not provide the articles which are required by a new and undeveloped country. One reason that Australia trades with England, rather than with the United States, is because England wants the wool that Australia is ready to furnish, and Australia wants the finished products that England provides. The United States, on the other hand, does not want Australian wool, so the character of the trade between Australia and the United States is very different from that of England with the former country. While Canada imports largely from the United States, Canadian products do not find a natural market in the United States, because the latter country itself yields so large a surplus of the same kind of products. If, therefore, free intercourse was established between the two countries, Canada would not profit largely from the change. Great Britain, on the contrary, happens to be the natural market for Canadian goods, so that they may be expected to go very largely to the mother country.[20] It does not necessarily follow, therefore, that the products of mother country and colony are adapted to exchange.

Commercial travellers everywhere play an important part in

[18] Anderson, "Trade Conditions in China," in *U. S. Monthly Consular Reports,* January, 1905, 51–52.

[19] Mansfield, *In the Land of Mosques and Minarets,* 40–41.

[20] Root, *Trade Relations of the British Empire,* 61.

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the extension of trade. Consuls have emphasized time and again the necessity of having representatives on the spot, who are familiar with the language of the people to whom they wish to sell, and who are skillful in pointing out the superiorities of the products they represent. Germany's success in trade is partly due to the fact that she has been foremost in adopting these suggestions, and has sent commercial travellers to all parts of the world to push German commercial interests.

Trade is influenced by *promptness, carefulness, and adaptability on the part of shippers.* Even such a seemingly unimportant matter as the making of invoices, if conducted carelessly, may lose trade. Complaints have come from Cuba that the United States merchants fail to make the invoices conform to the customs regulations, thus causing delay or heavy fines. Instances are known of Cuban merchants ordering goods from Europe for the sole reason that European merchants were careful to comply with their instructions. The loss of the trade of the United States with Java in 1903, as compared with 1902, was partly because goods inferior to samples shown were delivered, the delivery was slow, the packing poor, and often shippers failed to make good the losses from poor packing.[21] The Germans, on the other hand, are quite remarkable in their adaptability. They quickly see the needs of a particular place and regulate their business accordingly.[22]

The foregoing discussion tends to answer in the negative the oft-repeated question, "Does trade follow the flag?" It is quite in harmony with the following statement by Burrell:[23] "The interdependency of all countries shows that, commercially, the definition of a country is impossible. The stream of commerce runs through the nations in the same way as blood runs through the body, or as sap runs through a tree. It would be just as absurd

[21] Rairden, "Trade of Dutch Indies in 1903," in *U. S. Monthly Consular Reports*, January, 1905, 189–190.

[22] Elkind, "The German Troubles in South-West Africa," in *Fortnightly Review*, 83: 254–255.

[23] Burrell, "Plea for Absolute Free Trade," in *Westminster Review*, 160: 483.

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to speak of an arm as being a separate organism as to speak of a state being a separate country commercially. A State is to-day an integral part of one commercial whole, just as an arm is an integral part of the body to which it belongs. Trade, when left to itself, takes no more account of Governments than do migratory birds and fishes. And why it should, passes my comprehension."

But while political relations aside from tariff regulations have no direct influence upon the channels of trade, they do have quite a pronounced indirect bearing on the same, and one may safely say that there is usually some portion of the trade between mother country and colony which would not be in existence if the political ties were different. Whether this portion is a large or a small one is another question. Some of the influences at work to increase the trade between mother country and colony as compared with the trade of countries politically separate follow:

Investment follows *a* flag,[24] and *trade follows investment.* In other words the flag stands for security, which is so essential for the development of a large trade. Security is of two kinds: safety of life and property, and security arising from policies of government or trade which are known to be stable. American politics, for example, give an instability to industry which is unknown in England. The fact that business to-day is carried on almost exclusively by means of credit, the very foundation of which is confidence, lends added importance to security. Enterprise languishes whenever it is uncertain, or at least whenever there is not a fair prospect that the usual fruits of industry will be enjoyed. This applies to the colony as well as elsewhere.[25] The nature of the country which plants the flag is, therefore, of great moment to the commercial world. But there is, undoubtedly, often a feeling that capital is more secure under the flag of one's own country than under a foreign one. Capital has followed the British flag under the more or less definite belief that the Imperial Legislature could not, or would not, suffer a

[24] Cf. Caldecott, *English Colonization and Empire*, 186.
[25] Cf. Wakefield, *Colonization*, 81.

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colony to become bankrupt. The amount of power possessed by the Colonial Office is not investigated by the ordinary investor yet the sentiment of security remains.[26] A similar confidence is to be found among the citizens of other advanced countries, especially Germany, France and the United States. Investments thus tend to follow the flag and trade follows investments. Every extension of purchasing power means a movement of goods in some part of the world. The payment of interest or dividends, or the repayment of loans means that a larger amount of goods is being circulated. There are large investments in many of the colonies and these investments go out in the form of railway materials, telegraphic appliances, etc. Caldecott accounts for England's large per capita colonial trade on the ground that English capital has shown a preference for the colony and the borrowing of capital determines the flow of trade.[27]

Trade also follows the citizen. Germany recognizes this fact in encouraging emigration to the German settlements in southern Brazil. While disclaiming any intention of conquering any of the South American territory, Germany knows that the emigrant who goes to join the thousands of prosperous German agriculturists there will remain a purchaser of German goods longer than if he settled among other nationalities. The descendants of these settlers have, through generations, preserved their identity as Germans, and, therefore, still show a preference for goods of German

[26] Caldecott, *English Colonization and Empire,* 188.

[27] *Ibid.,* 188–189. Conant (*United States in the Orient,* 74) says: "The development of a new country by means of railways, roads, and docks is the forerunner of higher civilization, better wages, enlarged wants, and increased consumption. The benefits of this larger market for goods usually fall to the country which provides the capital for the primary develppment, especially if it is that country also which, by its political control, affords the guaranties of security and order." Professor Conant does not give the reasoning by which he reaches the above conclusion and the writer has been unable to discover any real foundation for it. Even if we agree that the benefits of the larger market usually fall to the country making the initial outlay, it is difficult to see where the commercial advantages arising from political control come in.

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origin.[28] In all the colonies the majority of the population other than native is usually from the mother country. In the tropical colonies especially, while the white population is very small, it is almost entirely from the mother country. For example, of the 2,346 white or European inhabitants in Congoland in 1902, 1,465 were Belgians.[29] Where the home nationality thus preponderates it is not at all strange if the chief orders for goods for colonial use should be placed with the mother country.

The English colonies bear testimony to the fact that the colonial is a good customer of the mother country. Taking man for man, the people of the English colonies, exclusive of India, consume British products to a much larger amount than do foreigners. The average annual per capita consumption of British manufactures is about 8s. in the United States and Germany, 9s. in France, £1 15s. in Canada, £2 5s. in the West Indies, £3 in South Africa, and nearly £8 in Australasia. "Thus three or four millions of people in Australasia take more of British goods than about fifty millions of people in Germany, and nearly as much as sixty millions of people in the United States. Only an artificial boundary separates Canada from the United States, yet an emigrant who goes north of that boundary immediately begins to purchase more than three times as much of British goods as one who goes south of it. As a customer to the British artizan one Australian is worth sixteen Americans; one South African is worth seven or eight Germans."[30]

One of the best illustrations of the manner in which trade follows the citizen comes from the Cape of Good Hope. While American locomotives and trucks are eminently suited to the railway service between Cape Town and Pretoria—a distance of one thousand miles—the prejudice of English railway employees against anything except the English machinery to which they had been accustomed, proved to be an insurmountable obstacle to any

[28] *Cf.* Speck von Sternburg, "The Phantom Peril of German Emigration to South American Settlements," in *North American Review*, 182: 644.

[29] Bourne, *Civilisation in Congoland*, 281.

[30] Parkin, *Imperial Federation*, 280.

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innovations. At one time, two Baldwin locomotives and a dozen freight cars were brought out from Philadelphia. They worked very well so long as the American manager remained in charge, but when he returned to America everything began to go wrong for the English workmen took especial satisfaction in discovering difficulties for the new engines. The result has been that these prejudices have won, and all the colonial railways of British South Africa are a duplicate of the system in England.[31]

The services of missionaries in promoting trade have been considerable and further illustrate the fact that trade follows the citizen. "You have heard it said that trade follows the flag. On the contrary trade follows the missionary and the flag follows trade. A missionary goes into the Himalaya Mountains; soon he is not satisfied to see the women drudging at their poor sewing, accomplishing so little with such great pains, and he sends for a Singer sewing machine. The missionary to China does not like to see children die for want of proper nourishment, and he sends for Nestlé's food. The missionary to Burmah has compassion for his poor people, subject to rheumatism and to the bites of venomous reptiles and insects, and he sends to Rhode Island for a famous pain-killer. So trade begins." [32]

A *knowledge of the peoples and the conditions existing in the countries to which one wishes to sell* is essential to success. And this knowledge must extend even to the psychology of the desired customers. Brown, writing regarding trade in the Canary Islands, says: "In fact, the exporters must bear in mind that their customers are passing through the stage when artificial flowers are considered superior to the natural article." [33] That Japanese manufacturers know the desires of their customers in the Far East gives them a distinct trade advantage there, of which fact Japan is cognizant.[34] And the Japanese are not content with this natural advantage but they are putting forth great

[31] Bigelow, *White Man's Africa*, 154–155.
[32] Grant, *Observations in Asia*, 119–120.
[33] Brown, *Madeira and the Canary Islands*, 268.
[34] Stead, *Japan To-day*, 231; Stead, *Great Japan*, 204.

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efforts to gain a stronger foothold in the world's commerce. In 1895 Japan began the practice of sending out special individuals to obtain information regarding trade conditions and possibilities of other countries. From 1895 to 1901, 124 of these investigators, many of whom are students, were sent abroad by the Government. This plan proved so fruitful that it is being adopted by Japanese business houses. The concern Mitsui Bussan Kaisha has set apart 30,000 yen annually to meet the expense of sending young men to China, and other nations for the promotion of its business.[35] It is quite true that the tastes of people must first be learned before one knows what to offer them. Standards of value must be mastered that prices may be expressed in terms intelligible to the prospective buyer. The customary use of credit and the prevailing rates of interest must also be determined. It was expected by many that the recent political relation between the United States and Cuba would, of itself, tend to increase trade between the two countries and that immediately. It was forgotten that close commercial relations had existed for years between the Cuban merchants and those of Europe, and that on each bill of goods it was customary to extend credit for six to eighteen months. The rate of interest in Cuba being from eight to fifteen per cent made the extension of credit of great importance to the Cuban merchants. The United States merchants not being accustomed to such long credits have, as yet, only partially adapted themselves to the Cuban situation. On the other hand, Germany's commercial importance in South America is largely ascribed to the fact that she sends there commercial travellers who have a knowledge, not only of the German language, but of Spanish and English, and who, moreover, are prepared to give from six to twelve months' credit. Van Cleave says: "But we need something more than a merchant marine to enable us to win new markets, or to hold those which we now have. We must learn the world's needs and tastes in merchandise, and set to work intelligently to supply them. This is particularly true of South America. Partly through better shipping facilities, but

[35] Stead, *Great Japan*, 191–194.

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chiefly through a better knowledge of the people and their wants, England and Germany are far ahead of us in their trade with South America. In 1906 we bought twenty per cent of all the merchandise which South America exported, but we sold to her only twelve per cent of what she imported." [36]

Since the citizens of a country are more apt to have an intelligent knowledge of their own colonial possessions than they would have of the same teritory if it were controlled by another country, another factor which favors trade following the flag, appears. Commercial agents are sent from the mother country to the colony to get a first-hand view of the situation; the newspapers and magazines abound with articles concerning the home colonies; and book agents find plenty of well-illustrated books ready to meet their demands. Within recent years an extensive literature on colonial questions has come into existence and has found many readers.[37] The owners of the various African colonies and dependencies have carried on most extensive explorations and investigations in their territories. The result is that Africa, with few exceptions, is better mapped than South America. The French in their possession, and the Germans in Kamerun, have kept many surveyors busy. The German maps are marvellously detailed, showing all variations in the surface, the plateaus, savannahs, water courses, and the native villages and their connecting paths. In 1903 they issued a map showing the distribution of metals and other minerals in the vast region of German East Africa. Austro-Hungary has recently published a colossal official report on Bosnia and Herzegovina which contains much valuable information.[38] The various colonial institutes of Europe are also invaluable for acquainting the people of the mother country with conditions in their colonies. The universities, more-

[36] Van Cleave, "What Americans must do to make an Export Business," in *Annals of the American Academy of Political and Social Science*, 29: 31.

[37] Among the later books Stokes' *Mines and Minerals of the British Empire* is an excellent example of carefully prepared and detailed information regarding colonial conditions.

[38] *Cf.* Thompson, "A Ride through Bosnia and the Hercegovina," in *Nineteenth Century*, 61: 696.

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over, give some attention to colonial affairs. The Prussian government in 1887 established an Oriental seminar, which is connected with the University in Berlin, and which offers special facilities for studying the languages of Oriental countries, and the native languages of the German colonies. It also offers courses upon colonial subjects, such as tropical hygiene, colonial geography, and economic botany.[39] Similar colonial courses are being introduced in some of the American universities. In addition, visits from mother country to colonies and from colonies to mother country increase the general knowledge of imperial conditions. Englishmen especially are going out in increasing numbers to visit the colonies and many colonists in turn visit England.[40] The addresses and lectures of returned missionaries, or those home on a visit, have been a considerable source of information to the general public regarding colonial conditions. According to Caldecott[41] the knowledge necessary to the great mass of the English people for the proper exercise of citizenship in an imperialistic country like England is supplied chiefly by their religious organizations.

In many instances, nevertheless, the grossest ignorance is shown regarding the colonial possessions. French writers have not hesitated to charge the colonial disappointments of France to a national lack of knowledge regarding colonial conditions—their importance, size, wealth, needs and interests. Not a single authoritative work has, according to Maugham, as yet been written about the vast territory of Portuguese East Africa, and thousands yearly pass it by without notice. But this colony is too near occupied territory, however, to be neglected much longer.[42]

The *use of a common language* facilitates trade between countries with this bond. For this reason attention is being called to the fact that the Germans are exerting themselves to increase their

[39] Loeb, "German Colonial Fiscal System," in *Publications of the American Economic Association*, 3d ser. 1: 438–439.

[40] Caldecott, *English Colonization and Empire*, 243.

[41] *Ibid.*, 256.

[42] Maugham, *Portuguese East Africa*, 330–331.

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linguistic hold in the extreme Orient, and that growing attention is being paid to German in Japan without outside help.[43] In colonial work the French, Spanish and Portuguese try more than other nations to assimilate the native populations, and they are very successful in promulgating language, in which work the Catholic church is a great aid. In many cases their languages have outlived their rule. The French have thus left the impress of both religion and language upon the French islands of Martinique and Guadeloupe.[44] English is now the school language of the Filipinos, just as under Spanish rule, Spanish was nominally to be learned in all the schools.[45] English is supplanting all other languages in Canada as in Dutch South Africa,[46] and the knowledge of English is spreading rapidly in India.[47] Formosa, in turn, contains a school in every local center for teaching the Japanese language to natives and native languages to Japanese.[48] Miller says that every official that he met in Bosnia and Herzegovina, no matter from what part of the monarchy, spoke the language of the people and adds: "British imports are comparatively few, and so long as British merchants continue to send their circulars in their own language and to express their prices in their own currency they will have no chance of success."[49]

In the tropics as a rule the native languages are retained. The Dutch have tried to discourage the use of their language in Java, but they expect their officials to master the native languages in the colonial training schools before going to the colonies. Therefore, the study of language, including Javanese, is much insisted on in the Civil Service appointments for the Dutch East Indies.[50]

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[43] Consul Thomas H. Norton, "Language," in *U. S. Consular Reports*, September, 1907, 91.

[44] Bigelow, *Children of the Nations*, 188.

[45] Colquhoun, *Mastery of the Pacific*, 136.

[46] Bigelow, *op. cit.*, 223.

[47] Elwin, *Indian Jottings*, 152.

[48] Colquhoun, *op. cit.*, 390; *Statesman's Year-Book*, 1908, 1220.

[49] Miller, *Travels and Politics in the Near East*, 113.

[50] "Colonial Administration," in *Monthly Summary of Commerce and Finance*, October, 1901, 1337–1338.

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Likewise, under British regulations, men who pass the examination of the Eastern Cadet Service and select the Hong Kong service are sent to Canton for two years to study Chinese.[51]

Our conclusion is that in all colonies, where the language of the mother country is spoken, it is comparatively easy to establish trade relations between the governing country and its possession; and, even if the native languages in the colonies are retained, the mother country and colony are in better position from the standpoint of language than foreign country and colony to carry on trade.[52] There are, of course, exceptions to the above generalizations. It is the Italians and Spaniards and not the French who furnish the language of the white man in Algeria and Tunis.[53] The British administration in Egypt was handicapped for many years because it retained French as the official language instead of introducing English.[54] In St. Thomas English is the working language and English signs adorn the streets.[55] In Santa Cruz also, while the black policemen wear Danish helmets, their speech is English, as is that of the negro population as a whole there, and official notices bearing the name of the king of Denmark are in English.[56] The Danish policy in Greenland has greatly retarded commerce and the general development of the colony because instead of encouraging the natives to learn the Scandinavian language and thus be brought more closely in touch with Iceland, Denmark, Norway and Sweden, and civilization in general, all efforts have been made to prevent even the adoption of foreign terms; nor do the Danes learn Eskimo.[57] Again, complaints are often made that German functionaries do not try to learn the native languages, yet when self-interest in extending commerce is involved young German traders will learn even such

[51] Colquhoun, *Mastery of the Pacific*, 344.
[52] Ireland, *Far Eastern Tropics*, 25.
[53] Bigelow, *Children of the Nations*, 249.
[54] Penfield, *Present-Day Egypt*, 327–330.
[55] Bigelow, *op. cit.*, 184.
[56] Bigelow, *op. cit.*, 203.
[57] Carstensen, *Two Summers in Greenland*, 178–180

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a difficult language as the Chinese.[58] The trade of Turkey goes to other countries than England because of "the wretched education in modern languages with which most Englishmen are afflicted"—a disadvantage not suffered by German and Austrian commercial travellers.[59] China's trade with Chinese Turkestan suffers because Chinese officials either are or pretend to be ignorant of the language of the possession and as a rule employ Mohammedan interpreters.[60] On the other hand, trade is encouraged between China and Manchuria because Chinese is the working language of that colony.

Trade is influenced by *banking and monetary conditions.* It is true that with primitive peoples trade is still carried on to some extent by means of barter, but such trade is necessarily very limited in character. Business is certainly encouraged between countries having the same monetary standard, and the extension of branch banking has been of great value in furthering commerce. The banking facilities of the West Indies have had something to do with the large trade between the United States and those Islands.[61] Now, since banking interests in the colonies are usually to a large extent under the control of citizens from the mother country, trade receives another encouragement to follow the flag. These colonial banks are always of great service to the trader in the home land. If the shipper has any doubt as to the purchaser's reliability, he writes to the bank for information. If he wishes the aid of a colonial lawyer or broker, he writes to the colonial bank. If he visits the colony, he secures a letter of introduction from the home bank to the colonial one, and presents himself for advice as to the best openings in business or as to efficient methods of developing trade. That the United Kingdom, therefore, has an "Imperial banking system" which centers in London is a matter of great commercial importance. Many of the colonial banks also have branch offices in

[58] *Cf.* Wilder, "China," in *U. S. Consular Reports,* September, 1907, 76.
[59] Miller, *Travels and Politics in the Near East,* 495–496.
[60] Deasy, *In Thibet and Chinese Turkestan,* 331.
[61] *Cf.* discussion of paper by Flux, "Flag and Trade," in *Journal of Royal Statistical Society,* 62: 532.

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London with London boards of directors. The Bank of Africa, the Bank of British Columbia, the Bank of New Zealand, the Bank of Australasia, and others have their head offices in London.[62] France and other countries have a somewhat similar imperial banking system. The Comptoir National d'Escompte de Paris has agencies at various points in Madagascar, and there is also a private bank, the Banque Grenard, which draws on the Crédit Lyonnais of Paris.[63] There are at least three Dutch banks in Java, and the banks in Holland also make heavy advances to colonials, so much so that in 1885, for instance, when the Dutch colonies were suffering from the effects of the low prices of sugar and other agricultural products, the mother country narrowly escaped a financial and commercial crisis.[64] In 1903 there were ten banks in the Philippines, among which were agencies of foreign banks in India, Australia, Hong Kong and Shanghai, also some Spanish banks, but three of the ten were American banks established there since American possession. In the Austrian possessions the Banque Privilégiée de Bosnie et d'Herzégovine was created with a large capital, and the majority of the stockholders are also stockholders of the Bank Verein of Vienna.[65] After Formosa was occupied by the Japanese a branch of the Thirty-fourth Bank, which has its headquarters at Osaka, was opened at Taihoku and shortly after the Bank of Formosa was established by the Government.[66]

Common coinage regulations[67] and use are also not without influence upon trade, although of secondary importance. For example, in most of the German colonies the imperial coins have been made legal tender;[68] in Bokhara Russian paper roubles are

[62] *Cf.* Caldecott, *English Colonization and Empire,* 189.

[63] *Vid. Statesman's Year-Book,* 1904, 640.

[64] Eckstein, "How a Financial and Commercial Crisis was avoided in Holland," in *U. S. Consular Reports,* July, 1885, 420.

[65] Barré, *La Bosnie Herzégovine,* 203–204.

[66] Takekoshi, *Japanese Rule in Formosa,* 280.

[67] *Vid.* Muhleman (*Monetary Systems of the World*) on early colonial monetary conditions.

[68] Loeb, "German Colonial Fiscal System," in *Publications of American Economic Association,* 3d ser., 1: 441.

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current everywhere;[69] Japanese coinage is used in Formosa;[70] but in the Danish islands, St. Thomas and Santa Cruz, an exception again appears, as American dollars pass current and purchases are made at the rate of so many cents, not so many gulden or krone.[71]

Transportation and facilities for communication also help to determine the direction of trade. That England has lost the leading position of importer to Costa Rica, and that the United States now supplies more than half of that country's imports, is due to the superior transportation facilities of the United States.[72] In Liberia, an undeveloped country with great natural resources, there is a strong demand for American goods, but the trade between the Republic and the United States is very small because there are no direct lines of communication between the two countries. The natural advantage of the United States in South American trade (especially trade with the northern states of that continent) is largely annulled by England's superior shipping facilities.[73] Germany's success in trade has been partly due to the action of the German government in subsidizing steamship lines to all parts of the world.

Since communication facilities are often better between mother country and colonies than between colonies and foreign countries, another inducement for trade to follow the flag appears. The French steamers, for example, make good connections with the French possessions, and chiefly German vessels visit Togoland and the other German colonies. Since Japan took charge of Formosa there are six regular sailings between the colony and its governing country. Takekoshi says: "Since Formosa passed into our possession the sea routes have undergone most remarkable changes."[74] Up to the time of Japanese occupation of Formosa the carrying trade between Tamsui (Formosa) and Amoy

[69] *Statesman's Year-Book*, 1908, 1468.
[70] *Ibid.*, 1221.
[71] Bigelow, *Children of the Nations*, 203.
[72] *Cf. U. S. Monthly Consular Reports*, December, 1904, 130.
[73] *Cf.* Davidson, *Commercial Federation and Colonial Trade Policy*, 99.
[74] Takekoshi, *Japanese Rule in Formosa*, 257.

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was almost entirely monopolized by a British firm, the Douglas Steamship Company. Subsequently, owing to subsidization of Japanese lines, it is almost entirely shut out, except as it sends one or two boats to Tamsui during the tea season.[75] In 1902 there were eleven subsidized routes receiving a total subsidy of 664,209 yen.[76] The different mother countries of the West Indian islands have also paid heavy subsidies to steamers plying between the mother country and colony, and to-day this system of European subsidy continues, while from one island to another the means of intercourse are very unsatisfactory.[77]

Trade is influenced by *official attitude towards commerce.* In the British possessions and indeed in most of the other colonies it is left to individual enterprise to push the sale of goods. But French officers and civil servants receive official instructions to favor French merchants and to push the sale of French wares and this may be a reason aside from discriminating duties that Madagascar now buys more goods of France than it did before it came under French dominion.[78] The German colonial officials also do not hesitate to give practical and active assistance to German traders. Such government advertising of goods cannot be without effect.

Although it is only exceptionally that *sentiment*[79] discriminates against goods of any nationality, yet at times it may reach such a high point that it predominates in determining the origin of

[75] *Ibid.*, 257–258.

[76] *Ibid.*, 260.

[77] Bigelow, *Children of the Nations*, 305.

[78] *Cf.* Davidson, *Commercial Federation and Colonial Trade Policy*, 141.

[79] "If by the maxim trade follows the flag it must be understood that people will prefer poor and dear goods to cheaper and better goods simply because the former were manufactured under the flag, few would be found to defend it. Sentiment undoubtedly has a strong influence on trade and patriotism is one kind of sentiment. But its influence is not exerted in this simple way. Its effect is more indirect. It may alter the estimates which people place on goods. Prejudice and custom may so modify a man's tastes and inclinations that he prefers goods made under the flag. But this is because goods made under the flag are in themselves different goods from apparently similar articles made elsewhere." Davidson, *op. cit.*, 144.

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goods. It is said that during the crisis produced by Emperor William's telegram to President Kruger, goods bearing the trade mark "Made in Germany" were in many places quite unsalable. Because Germany has given support to Turkey, Turkish trade follows the German flag and not the British.[80] But sentiment is not all-powerful as societies to encourage consumers to use home products have found. Yet sentiment is often a factor in trade between mother country and colony through the operation of government expenditures, for governments are expected to encourage imperial trade whether it is the economical course or not. Nevertheless governments do not always do this but sometimes consider the taxpayer and purchase government goods in the cheapest market. Yet if any favoritism is shown it is apt to be in favor of imperial goods as compared with foreign.

To summarize: we find that factors encouraging imperial trade are colonial investments, emigration of citizens to colonies, knowledge of colonial conditions, use of a common language, common banking and monetary conditions, better transportation and facilities for communication, official attitude and sentiment. Even leaving out of account the movement of goods which is due solely to tariff regulations, there is warrant then for saying that a certain part of the trade between the mother country and the colony is due to their political relation. How much we can only conjecture. That the popular view exaggerates the amount of such trade must be admitted.

The conclusions drawn from the study of trade returns are that the commerce of the newer colonies especially is growing faster than that of the mother countries; that a large proportion of the trade of the colonies is with their respective mother countries; that viewed from the standpoint of the mother country colonial trade is insignificant as compared with foreign trade; and that the proportion of the trade of the mother country which is derived from her colonies is, as a rule, not an increasing one.

[80] *Cf.* Miller, *Travels and Politics in the Near East*, 496.

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Year.	Countries.	Imports.		Exports.	
		Per Cent. from Possessions.	Per Cent. from Foreign Countries.	Per Cent. to Possessions.	Per Cent. to Foreign Countries.
1908	United Kingdom	21.8	78.2	33.3	66.7
1905	France[81]	3.3	86.7	4.8	95.2
1908	Germany	.3	99.7	.9	99.1
1908	Netherlands	14.3	85.7	4.1	95.9
1908	Portugal	2.9	97.1	15.8	84.2
1908	Belgium	1.6	98.4	.6	99.4
1908–09	United States	6.8	93.2	3.2	96.8
1906	Denmark	1.1	98.9	1.1	98.9
1906	Japan	4.3	95.7	3.6	96.4
1904	Turkey[82]	7.5	92.5	1.7	98.3

The trade of the German colonies shows a considerable growth even in a decade.[83] The total trade of the colonies (exclusive of Kiauchau) averaged from 1892–1896 a little more than 27 million marks; in 1905 it was over 97 million marks or almost four times larger in 1905 than in the earlier period. The special trade of the mother country during the same time did not quite double. In 1908 the trade of the German colonies reached 138 million marks. The trade of Kiauchau during the period of German occupation has also been quite satisfactory. It has grown from 19 million marks in 1901 to 116 million marks in 1908,[84] or almost as much as the trade of all the other German possessions together.

The proportion of the trade of the German colonies which is with the mother country varies greatly in the different possessions. In 1902 the proportion of imports from Germany ranged from 9 per cent (West Caroline Islands) to 84 per cent (South West Africa); the proportion of exports to Germany showed

[81] Exclusive of Algeria and Tunis.

[82] Including Bulgarian trade.

[83] Trade of the German Colonies (Exclusive of Kiauchau).

Year Average.	Imports marks.	Exports marks.	Total Trade marks.
1892–1896	15,200,000	11,833,000	27,034,000
1905	69,234,000	27,837,000	97,068,000
1908	91,857,000	46,450,000	138,307,000

[84] *Statistisches Jahrbuch für das deutsche Reich.*

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equally great variations, 16 per cent (South West Africa) to 93 per cent (East Caroline Islands).[85] Taking the German possessions as a whole, the proportion of trade with the mother country is an increasing one.[86]

The German colonies make a favorable trade showing also in that the proportion of the mother country's trade which is colonial is larger than formerly. But when the colonial trade is compared with Germany's foreign trade the relative insignificance of the former becomes apparent. The trade with the colonies will have to grow a great deal before the German possessions can be regarded as of any considerable commercial importance to the Empire.[87]

The methods employed by the Germans in developing the colonies are often quite different from those used by the English and the results are correspondingly different. A comparison of German East Africa with British East Africa shows that the former colony has a series of ports and more navigable rivers than British East Africa, and probably is richer in mineral wealth; and that the Germans have spent money upon German East Africa more freely than the English have upon British East Africa. The development of the former, however, does not promise to be so rapid as that of the latter. The reason is that the British centered their energies on the construction of the Uganda Railway to open up the country while German expenditures have taken other forms, such as for palaces, fortresses, lighthouses, educa-

[85] Compiled from *ibid.*

[86] PROPORTION OF TRADE WITH GERMANY.

Year Average.	Imports per cent.	Exports per cent.	Total Trade per cent.
1892–1896	39.2	38.0	38.7
1905	67.9	58.0	65.1
1908	62.3	65.8	63.5

[87] PROPORTION OF GERMANY'S SPECIAL TRADE WITH HER COLONIES (EXCLUSIVE OF KIAUCHAU).

Year Average.	Imports per cent.	Exports per cent.
1892–1896	0.1	0.2
1905	0.2	0.8
1908	0.4	0.9

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tion, and so on.[88] German methods, it will be seen, do not lead so directly to trade development as do the British.

Lister in his report on the French colonies says that the "value of the Colonies to France is commercial; her conquests should be economic, and the object of her colonial policy should be not to plant offshoots of the French race in new countries . . . but to further the economic development of these countries in order to secure commercial outlets."[89] Commercial motives are becoming increasingly predominant. The French colonies in the Orient are mere commercial outposts. It is the chief aim of the administration in Indo-China to encourage trade with France. These efforts, however, have not been very successful. The leaders in the import trade are British and German, and the Chinese are chiefly in control of the export trade and domestic transactions.[90] The great natural obstacle to the development of Indo-China is the absence of navigable rivers. The Songkoi river in Tongking turned out to be worthless as a waterway. Attention therefore has been turned to railway projects. The Tongking-Yunnan line which is to traverse Yunnan, the southwestern province of China, is designed to secure the trade of Szechuan, which is a very rich and populous province of China. But there are two chief factors which promise to defeat this plan. One is that the trade of Szechuan can more easily be carried by way of the Yangtse waterway; the other is the restrictive influence of the French customs which examines everything, fails properly to close the packets, and in other ways hinders trade.[91] The development of Indo-China has been hindered most of all, however, by a defective colonial system. Tongking and Cochin-China especially are capable of development for both are very fertile countries, having great rice-growing deltas. Taken as a whole, the fertility of the French colonies comprised under the term Indo-China is very great. The principal products are rice, Indian corn, tobacco,

[88] Eliot, *East Africa Protectorate*, 256–261.

[89] Report by the Honorable Reginald Lister, His Majesty's Minister at Paris, on the French Colonies, 1–2.

[90] Morris, *History of Colonization*, 1: 454.

[91] Colquhoun, *Mastery of the Pacific*, 411–412.

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vegetables and tropical fruits. Cotton, tea, coffee and sugar are also cultivated. Coal, antimony and the precious metals are abundant. Railroads, transport lines and new industries are being rapidly introduced and the outlook for the material progress of these regions is very promising. But France must solve two great problems before these vast resources can be developed. These are the maintenance of tranquillity among the native populations and the immigration of enough Frenchmen to promote and to manage properly the proposed enterprises. The framework of success has been prepared, but so far the principal actors are still lacking.[92]

Among the French possessions Algeria and Tunis enjoy exceptional prosperity. The commerce of Algeria is largely in the hands of the French. The growth of the wine industry has been very remarkable.[93] The chief export is wine, a fact of especial interest to France since she is the greatest wine-consuming country in the world. Tunis has a better climate and richer soil than Algeria,[94] and is undergoing a great commercial development—greater even than Algeria. Still more prosperity is predicted for Tunis when the great trade route from the Mediterranean to Lake Tchad in the heart of Africa is opened up. "French influence in Africa will then receive a commercial expansion that is its due." [95]

There are two factors to be taken into consideration in order to account for the small trade of the French possessions in West Africa (Senegal, Guinea, Ivory Coast and Dahomey) as compared with the immense area of the country. In the first place, enormous districts of the French possessions are not at all fertile and produce only one marketable commodity—gum from the

[92] Morris, *History of Colonization*, 1: 454–455.

[93] THE WINE INDUSTRY IN ALGERIA.

Year.	Gallons produced.
1872	4,994,000
1880	9,504,000
1888	60,742,000
1898	100,194,600

Mansfield, *In the Land of Mosques and Minarets*, 55–56.

[94] *Cf.* Clayton, *Les colonies françaises*, 233.

[95] Mansfield, *op. cit.*, 62.

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stems of the *Acacia horrida*—and, while this gum is found in abundance, pickers are not plentiful. Labor is especially scarce since the French authorities have forbidden native raiding to secure slaves for this work. In the second place, France possesses nearly all of the regions containing the tawny Moors, a people of commercial enterprise. From the earliest historical accounts of these Moors up to the present time they have drawn the trade from the rich and fertile districts, carried it across the desert to trade with the white Moors who in turn delivered the goods to Mediterranean and Red Sea ports. But the Portuguese opened up the West Coast seaboard trade and as a result, the tawny Moors for four hundred years have been suffering from commercial wars. This accounts in part for the decay of the great towns of Timbuctoo, Jenne, Mele and others. In addition, native religious wars and strife have decreased the economic prosperity of these regions.[96]

The French colonies as a whole (exclusive of Algeria and Tunis) carry on a large proportion of their trade with France. The percentage for 1905 was 43.3. This is a falling off from 1880 when the proportion of trade with France was 53.5 per cent.[97] France's trade with the colonies does not loom up very large in comparison with French foreign trade. In 1905 it

[96] Kingsley, *West African Studies*, 235–237.

[97] TRADE OF THE FRENCH COLONIES (EXCLUSIVE OF ALGERIA AND TUNIS).

Year.	Total Imports.	Imports from France.	Per Cent.	Total Exports.	Exports to France.	Per Cent.
1880	136,048,000	51,427,000	37.8	151,502,000	102,400,058	67.6
1889	207,196,000	73,994,000	35.7	200,871,000	104,840,000	52.2
1899	345,565,000	178,119,000	51.5	310,165,000	135,753,954	43.8
1905	492,992,000	227,632,000	46.6	387,936,000	153,482,000	39.6

Year.	Total Trade, Francs.	Total Trade with France, Francs	Per Cent. with France.
1880	287,551,000	153,827,000	53.5
1889	408,067,000	178,834,000	43.8
1899	655,731,000	313,873,000	47.8
1905	880,928,000	381,115,000	43.3

Compiled from *Statistiques Coloniales pour l'année 1889*, 119, 121; *Monthly Summary of Commerce and Finance*, October, 1901, pp. 1533, 1535; and *Report by Lister on French Colonies*, 50.

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formed only four per cent of the total French trade, and this was a gain over earlier periods, for in 1880 the proportion was 1.8 per cent.[98]

Among the British colonies the self-governing possessions carry on the largest trade with the mother country in absolute amounts and in proportion to their total trade. Root[99] holds that one reason that so many of the British possessions which are not self-governing communities are in a backward condition is because there is the tendency, as in India, to regulate trade as well as finance in the interests of the governing minority instead of in the interests of those governed.

In 1908 the total imports of the United Kingdom amounted in round numbers to 593 million pounds of which the colonies contributed 130 million; the total exports were 377 million pounds in value and of this sum almost 126 million went to the colonies. The proportion of British trade with the colonies was, in 1908, 26.3 per cent. It will readily be seen that the British colonies are a much more important commercial asset than are other colonies to their respective mother countries. On the other hand the proportion of colonial trade which goes to Great Britain is less than formerly[100]—another illustration of the tendency of trade to become denationalized as a colony develops.

[98] COMMERCE OF FRANCE.

Year.	Per cent. of imports from colonies.	Per cent. of exports to colonies.	Per cent. of total trade with colonies.
1880	2.1	1.5	1.8
1889	2.4	1.9	2.2
1899	3.0	4.3	3.6
1905	3.3	4.8	4.0

Compiled from *Statesman's Year-Book*, 1906, p. 861, and other years.

[99] *Trade Relations of the British Empire*, 201.

[100] PROPORTION OF TRADE OF BRITISH COLONIES WITH THE UNITED KINGDOM.

Year.	India, Per Cent.	Self-governing Colonies, Per Cent.	Other Colonies, Per Cent.	Total Possessions, Per Cent.
		Exports.		
1867–71	52.6	55.4	46.4	52.1
1902–03	27.1	47.8	20.6	35.6
		Imports.		
1867–71	69.2	57.5	34.3	57.4
1902–03	64.2	41.4	24.9	42.5

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Belgium, or more correctly speaking, the sovereign of Belgium has profited greatly from the commercial exploitation of Congo Free State. During the five years 1897–1901 the import trade of the colony increased 4 per cent; but the export trade within the same time increased 234 per cent! Bourne[101] says:

"There have been further extensions of the *domaine privé* system, and the granting of monopolies under it, especially in the Kasai district, and the enterprise of the privileged companies old and new has certainly not slackened, although through increasing difficulties in the collection of rubber, which now constitutes in value nearly seven-eighths of all the produce exported, their profits have been notably reduced. Hence the speculative value of the shares issued by the privileged companies has, in some cases, fallen to less than half the amount reached in their palmier days. For all that, however, it was reckoned in August, 1902, that the aggregate of the shares held by the State alone in those companies might have been sold for 80,000,000 francs or nearly thrice the 28,709,000 estimated for the entire revenue of the State in 1902. The State is still a valuable asset to its Sovereign and his partners; and others besides financiers and financial gamblers have been enriched by it."

The proportion of imports into Congo Free State from Belgium was in 1901 72.3 per cent of the total imports, and in 1908 practically the same—72.4 per cent; the proportion of the exports of the colony which went to Belgium was in 1901 and in 1908 93.3 per cent and 88.7 per cent respectively.[102] The reform policy so recently adopted, through throwing the territory open to trade,[103] may in time materially reduce these proportions.

[101] Bourne, *Civilisation in Congoland*, 280.

[102] TRADE OF CONGO FREE STATE.

Year.	Total Imports, Francs.	From Belgium, Francs.	Per Cent.	Total Exports, Francs.	From Belgium, Francs.	Per Cent.
1901	23,162,000	16,716,000	72.3	50,488,000	47,065,000	93.3
1908	27,226,880	19,733,560	72.4	44,412,670	39,429,000	88.7

Compiled from *Statesman's Year-Book*.

[103] "The Belgian Minister for the Colonies, in October, 1909, indicated his scheme of reform in the Congo. The natives would be granted the

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The East coast of Africa is divided between Italy, Great Britain, Germany and Portugal. Of these four spheres the Italian is the least attractive. Italian Somaliland consists of fort-like promontories without a single blade of grass or other verdure, and sand-storms frequently envelop the whole region. There are fertile valleys in the interior however, and the products are considerable. These consist of cattle, sheep, goats, hides, ivory and various gums. The colony suffers commercially from the lack of good harbors and the coast is inaccessible a large part of the year because of the monsoon.[104] The trade of Italian Somaliland is therefore considerably less than that of Eritrea.[105]

The Portuguese possessions in East Africa are older and richer than the Italian but they are not much more highly developed. Order is not yet entirely established, slave raiding is thought still to exist, capital is lacking and the customs tariffs are unfavorable to commerce. However, they yield a considerable amount of such products as ivory, cotton, copal, rubber and various valuable drugs.[106] The exports are mainly rubber, various ores, wax and ivory. Portugal receives a goodly share of the trade.

The chief products of Portuguese Angola are coffee, rubber,

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right to take the produce of the soil in the Domain. This would be accomplished in three stages. On July 1, 1910, the Lower Congo, Stanley Pool, Ubangi, Bangali, Kwango, Kasai, Katanga, the southern portion of the Eastern Province, Aruwimi, and the banks of the river as far as Stanleyville would be open to freedom of trade. On July 1, 1911, the Domain of the Crown, and on July 1, 1912, the Welle district would also be thrown open. Furthermore, the Government would levy taxes in money and the system of provisioning the agents would be abolished. In March, 1910, various decrees ameliorating the condition of affairs were voted by the Colonial Council, regulating taxation, abolishing the exploitation of Domain land by the State in July, 1912, and abolishing the powers of the *Comité Spécial* of Katanga." *Statesman's Year-Book,* 1910, p. 646.

[104] Eliot, *East Africa Protectorate,* 248–249.

[105] TRADE OF THE ITALIAN COLONIES.

Year.		Imports lire.	Exports lire.
1907–08	Italian Somaliland	2,260,944	1,299,201
1907	Massowah, Eritrea	10,605,877	2,188,205

Statesman's Year-Book, 1910, p. 970–971.

[106] Eliot, *op. cit.,* 251.

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wax, sugar for rum distilleries, vegetable oils, cocoa-nuts, ivory, oxen and fish. Cotton growing has become unremunerative, and is now neglected; and rubber supplies are becoming exhausted. The imports into Angola consist chiefly of textiles from Germany and Great Britain. Portugal secures the larger part of the export trade which consists chiefly of coffee and rubber.

The Portuguese colonies as a whole carry on a considerable trade[107] but not a large proportion goes to Portugal, yet the colonial trade forms a mentionable part of the total Portuguese trade: in 1908, 2.9 per cent of the imports came from the colonies and 15.8 per cent of the exports went thereto. The proportion of exports sent to the colonies shows an increase over earlier periods but both the relative and the absolute amount of imports of colonial origin is less than formerly.[108] The total trade with the colonies decreased from 7.9 per cent in 1888 to 6.8 per cent in 1908.

The Spanish colony Rio Muni on the Gulf of Guinea has a low and marshy coast region and contains vast forests. There are Spanish, French and English factories along the coast but trade is hampered because there are no harbors and the rivers are not

[107] TRADE OF THE PORTUGUESE COLONIES IN 1908.

	Imports.		Exports.	
Portuguese India	5,919,000	rupees.	2,069,000	rupees.
Macao	18,697,000	Mexican dollars.	17,755,000	Mexican dollars.
Timor	311,000	milreis.	358,000	milreis.
Cape Verde Islands	2,096,000	"	355,000	"
Portuguese Guinea	857,000	"	492,000	"
S. Thome and Principe	3,185,000	"	7,921,000	"
Angola	5,137,000	"	3,730,000	"
Portuguese East Africa	7,577,000	"	5,616,000	"

Statesman's Year-Book, 1910, pp. 1114–1121.

[108] TRADE OF PORTUGAL WITH THE COLONIES.

Year.	Total Imports, Milreis.	From Colonies, Milreis.	Per Cent.	Total Exports, Milreis.	To Colonies, Milreis.	Per Cent.
1888	47,981,000	3,497,000	7.3	32,956,000	2,910,000	8.8
1908	67,257,000	1,988,000	2.9	28,462,000	4,513,000	15.8

Compiled from *Statesman's Year-Book*.

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accessible to vessels. In the Canary Islands England has the commercial lead.[109] About 80 per cent of the exports go to England and about 40 per cent of the imports are of English origin. Imports of Spanish origin in 1865 formed 12.2 per cent of the total, and in 1895 13.9 per cent.

The trade statistics of Bosnia and Herzegovina are included in those of Austria-Hungary, the two provinces having been placed in the Austro-Hungarian customs district, so that data for these possessions are not readily available. Baron von Kállay has pointed out that the imports of the occupied territory were, about 1895, with few and unimportant exceptions, from Austria-Hungary. Miller[110] says that annual reports show the truth of this statement.

Of the Danish possessions the West Indies are usually considered the most important commercially. But the trade of these islands with the mother country has for some years been falling off until it is now a very small amount. From 60 per cent to 80 per cent of their trade is with the United States. Economic conditions in Iceland have been improving until its trade with Denmark is of more importance than that either of Greenland or the West Indies.[111] The total colonial trade with the mother country is comparatively unimportant, however, as it forms only from one to two per cent of Denmark's total trade.

The Dutch East Indies are the most important of the possessions of the Netherlands. Their trade during the last thirty years has grown rapidly but the gains are not so great as in the case of

[109] *Cf.* Ruiz y Benítez de Lugo, *Islas Canarias*, 79; Brown, *Madeira and the Canary Islands*, 267–268.

[110] *Travels and Politics in the Near East*, 112.

[111] TRADE OF THE DANISH COLONIES FOR 1906.

Colony.	Imports from Denmark kroner.	Exports to Denmark kroner.
Iceland	5,322,000	4,762,000
Greenland	1,027,000	432,000
West Indies	3,000	25,000
Total	6,352,000	5,219,000

Statesman's Year-Book, 1908, p. 904.

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the mother country.[112] The leading exports are sugar, coffee, rice, tea, indigo, cinchona, tobacco and tin. About one-half of the rice exported goes to Borneo and China, but of the remaining exports nearly four-fifths go to the Netherlands.[113] During the last twenty years the proportion of Dutch exports which go to the colonies has slightly decreased on the average but the percentages for 1888 and 1898 are almost identical—4.2 and 4.1 per cent respectively. The proportion of imports of colonial origin increased during the two decades from 9.3 per cent to 14.3 per cent.

Turkey has gradually lost even her nominal hold on her possessions, and the trade of the few remaining is not of great commercial value to Turkey.[114] Egypt, the most prosperous one, receives only 9 per cent of her imports from Turkey, and sends thereto only 1.9 per cent of her exports.

Although Russia has acquired vast areas in Central Asia the desired markets for goods have not been obtained because of the scantiness and poverty of the population. Russia, of course, does not feel the need of additional markets as keenly as do the

[112] COMPARISON OF THE RATE OF GROWTH OF THE TRADE OF THE NETHERLANDS AND THE DUTCH EAST INDIES.

Year.	Imports into Netherlands, Guilders.	Percentage Basis.	Imports into Dutch East Indies, Guilders.	Percentage Basis.
1875	218,846,000	100	125,672,000	100
1907	2,692,000,000	1230	247,271,000	196
	Exports from Netherlands.		Exports from Dutch East Indies.	
1875	538,971,000	100	177,076,000	100
1907	2,212,000,000	410	364,558,000	205

[113] *Statesman's Year-Book,* 1910, p. 1050.

[114] TRADE OF THE TURKISH POSSESSION IN 1908.

	Total imports.	Total exports.
Egypt	22,230,000 Egyptian pounds.	26,076,000 Egyptian pounds.
Anglo-Egyptian Soudan	1,892,000 Egyptian pounds.	516,000 Egyptian pounds.
Samos	26,302,000 piastres.	24,774,000 piastres.
Crete	21,071,000 drachmai.	18,372,000 drachmai

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strictly manufacturing nations, but by a system of strict protectionism the most possible has been made of all new territory acquired.[115] In Khiva, Bokhara and Turkistan cotton-raising is an important industry and is rapidly being extended. Transportation facilities have not been sufficient to carry the entire crops to market. The exports of cotton from Central Asia to Russia by way of the Caspian Sea alone amounted to over 214 million pounds in weight as early as 1900–1901.[116] Owing to the central location of Bokhara its foreign commerce is quite important and it has considerably advanced under Russian protection. Trade is principally with Russia, India and Persia, and is carried on by caravan routes and by means of the Trans-Caspian Railway. The entire foreign trade of Bokhara is estimated at 15 million dollars, of which two-thirds or 10 million dollars is with Russia.[117] Bokhara's imports of green tea, chiefly from India, are said to amount to 1,125 tons per annum. Other imports from India are indigo, Decca muslins, drugs, shawls and kincobs. Bokhara in turn exports raw silk to India in large quantities, the estimated amount for one year being 34 tons. The chief commercial products of Khiva are cotton, as mentioned above, and silk.[118] It has been suggested that the cultivation of amicable relations with Japan and China would guarantee Russia the facilities for trade and commerce[119] which are not supplied by Russian possessions.

Figures are not available to give any definite idea of the extent of the trade of China with her four possessions. It is of considerable importance, however. Chinese Turkestan carries on a heavy caravan commerce with China.[120] Russia also comes in for a share of the trade of Turkestan which is carried on in the same manner as from time immemorial. The traders carry their wares from place to place, their means of transport often

[115] Gerrare, *Greater Russia*, 308–309.
[116] *International Year Book*, 1902, p. 141.
[117] *New International Encyclopedia*, 3: 181.
[118] *Statesman's Year-Book*, 1908, p. 1467–68.
[119] Dyer, *Japan in World Politics*, 198.
[120] *New International Encyclopedia*, 16: 1011.

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being ponies. The wares of the traders consist chiefly of Russian cloths and chintzes because the Russian government pays such bounties on the export of these articles that Russian manufacturers are enabled to defy competition in Chinese Turkestan.[121] The commerce of Mongolia is almost wholly barter trade, brick tea being the chief medium of exchange. Mongolia has a considerable transit trade as it lies on the route from China to Russia. Manchuria was formerly chiefly valuable to China as a source of lumber supply but the recent development of Manchuria is giving importance to other lines of trade. Much of the trade of Tibet, like that of Mongolia, is carried on by barter. The preferred medium of exchange is the Indian rupee. The importance of Tibet as a factor in the world of commerce can only be guessed at. The commercial wealth of the country centers itself in the southern and eastern valleys. English trade with Tibet by way of India is very small and is estimated at £150,000 per annum.[122] There are no statistics available to show the value of Tibetan trade with China but estimates place the amount at not less than several million pounds.[123] The main article of commerce of Tibet, as well as of Turkestan, with the mother country is tea. The tea supplied to Tibet by Chinese tea gardens is estimated to be close to twelve million tons annually. The wealth of gold in Tibet lends importance to its trade. Holdich[124] says: "Tibet is not only rich in the ordinary acceptance of the term; she must be enormously rich—possibly richer than any country in the world. For thousands of years has gold been washed out of her surface soil by the very crudest of all crude processes and distributed abroad. Some has gone to India via Kashmir or Kumaon, some northward to Kashgar; but most of it undoubtedly has gone to fill the treasuries of Pekin. From every river which has its source in the Tibetan plateau, gold is washed." Indeed, Tibet has many products which stimulate commercial enter-

[121] Deasy, *In Thibet and Chinese Turkestan*, 342.
[122] Holdich, *Tibet, the Mysterious*, 326–327.
[123] Parker, *China*, 52.
[124] *Tibet, the Mysterious*, 329.

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prise. In southeastern Tibet silver, copper, lead, iron and mercury are all worked. Agate, borax, salt and musk also enter into Tibetan trade, while the vast forests of timber in eastern and southeastern Tibet await exploitation. Tibet, therefore, contains enough of material value to make it a commercial objective.

When Japan secured control of Formosa she also secured control of the camphor supply of the world, since the production of camphor is practically confined to Japan and Formosa. The camphor trees of Formosa cover an area of 1,500 square miles, so that although they are being felled at the rate of 10,000 trees a year, the supply at even the present rate of depletion is sufficient for a hundred years.[125] In the meantime the new system of reforestation which has been introduced will have had time to become effective. But unfortunately camphor can only be obtained when peace conditions exist. As soon as trouble occurs between the savages and the Formosans the industry is brought to a standstill. And over one half of Formosa is in the hands of savages who occupy the great timber belt containing the valuable camphor trees. The country can not be developed until these savage districts are opened up.[126] At the present rate of subjugation it will be many years before the savages are under sufficient control to allow their territory to be safely exploited. Other hindrances to the development of the camphor industry are the need of roads through the jungles to render the camphor trees accessible, the unsanitary conditions throughout much of this territory which greatly reduce the efficiency of the labor employed, and the unwillingness of coolies to engage in the industry owing to the dangers of attack from head-hunting tribes.

[125] Consul Arnold of Tamsui reports as the result of an interview with the chief of the camphor bureau of the Formosa government that, "Although investigations as to the number of old trees in the island are not as yet completed, the number of trees is far less than investigations a few years ago made it appear. Recent investigations warrant the statement that the supply of old trees will at the present rate of cutting, become exhausted in less than fifty years." *U. S. Consular Reports,* August 1907, p. 154–155.

[126] Takekoshi, *Japanese Rule in Formosa,* 172–182.

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Only a few years ago Formosan trade was chiefly with China but an increasing proportion is with Japan. In 1908 Formosa sent 27.7 per cent of its exports to Japan, and received therefrom 56.5 per cent of its imports; in 1898 the percentages were 25 per cent and 20 per cent respectively. In 1906 Japan derived 4.3 per cent of its total imports from Formosa and sent 3.6 per cent of its exports to that island.[127] Japan has certainly had good success in diverting Formosan trade to Japan.

The work of developing Korea is already begun. It is found that the Korean climate and soil are adapted to the raising of cotton and the future of the cotton industry in that country is full of promise.[128] Japan already receives a large proportion of the trade of this possession and can scarcely hope for gains in percentages even after the country is more highly developed, since Korea in 1908 sent 77 per cent of its exports to Japan and received 59 per cent of its imports from the islands.[129]

In the fiscal year 1908–09 the trade of the American possessions composed 4.1 per cent of the total trade of the United States. The imports from the colonies (Porto Rico, Hawaii, Alaska and the Philippines) amounted to 6.8 per cent of the total imports, and the exports to the possessions were 3.2 per cent of the total.[130] The trade of the American colonies, like that of many of the colonies of other countries, makes its best showing in the proportion of their trade which is with the mother country. In 1908–09 the proportion of imports from the mother country was 16.1 per cent for the Philippines, 81.1 per cent for Hawaii, 88.8

[127] On the progress of Japanese trade compare Stead, *Great Japan*, 205.

[128] *U. S. Consular Reports*, July, 1908, p. 116.

[129] Ladd, "Japan's Administration in Korea," in *China and the Far East*, ed. by Blakeslee, 409.

[130] TRADE OF THE UNITED STATES WITH THE POSSESSIONS.

	Imports from	Exports to
Philippines	$ 9,433,986	$11,189,441
Alaska	13,055,355	17,180,445
Hawaii	40,437,352	584,152
Porto Rico	26,391,338	23,272,170
Total	$89,318,031	$52,232,208

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per cent for Porto Rico; the proportion of the total exports sent to the United States was 32.3 for the Philippines, 98.5 per cent for Hawaii, 86.9 per cent for Porto Rico.

In considering the value of colonies as markets for goods, not only present but prospective trade must be taken into account. There is every reason to believe that the settlement colonies will continue to prosper as they have done in the past. Interest then centers around the tropical countries. Under present conditions some sort of control of the tropics is inevitable.[131] Although it is being found that articles such as sugar, which were formerly confined to the tropics, may now be produced in the temperate regions, the temperate zones are becoming increasingly dependent upon the tropics for raw materials and food products. Owing to this fact trade with the tropical regions is of great importance to the temperate zone countries. Gerrare maintains that the desire to control a base for tropical supplies is at the bottom of Russia's imperialistic ambitions. He says:

"Since Russia has attempted industrialism she feels the need all manufacturing nations have experienced of securing tropical produce which she can convert into goods, and of extending her markets amongst those who purchase such finished wares as she can supply. The first is the most pressing. England has India and other tropical possessions; Belgium has the Congo; France, Tonkin; Germany, parts of Africa, Papua and Borneo. . . . Without such properties no purely manufacturing community can compete successfully in the world's markets, and the necessity of possessing some such territory has forced itself upon modern Russia.[132]

"This is the real ground for apprehension Anglo-Saxons have in regard to India. Had Russia tropical possessions she would not be so jealous as she is of Britain's hold upon that country. She has approached Abyssinia. The existence there of co-religionists afforded an excuse and that act also shows the potency

[131] *Cf.* Giddings, *Democracy and Empire*, 284.

[132] This desire is doubtless an important factor but the writer would not lay the stress upon it that Gerrare does.

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of the idealistic policy. The real quest was tropical produce and in order to obtain a supply from a source she can absolutely control, she looks now upon Persia, Arabia and southern Asia much further east, as possible future possessions."[133]

But even after the tropical territory is secured it requires time to develop it. In German textile manufacturing circles, for example, it is greatly desired that a larger quantity of cotton be raised in the German colonies and the manufacturers of musical instruments express the wish that instead of being dependent upon foreign woods the German-African colonies which are known to contain woods of the desired varieties might be more thoroughly exploited.[134]

Although giving due recognition to the importance of the tropics as a source of supply for raw materials and food products the question still remains as to whether this interzonal trade will, from the economic standpoint, justify the acquisition of tropical colonies. The London *Economist* says:[135]

"The *Economist* has never been able to believe entirely in what may be called the plantation theory of colonization. . . . It is very doubtful whether the trade of any uncivilized region in the tropics, especially if inhabited by naked negroes, is worth the expense involved in its conquest, garrison and gradual reduction to industrial order, and quite certain that the trade will not be valuable for many years after settlement. All the articles which such negroes export can be obtained by dealers without conquering them and in most cases they fail to buy sufficient of our goods to pay the expenses which their subjugation entails. Uganda, for example, will not pay for itself in twenty years, and it is questionable whether the whole of East Africa will not be for at least a generation a losing concern."

There are certainly many obstacles to be overcome before tropical trade can be developed to any extent. In the first place, the products of a tropical region often are confined almost exclu-

[133] Gerrare, *Greater Russia*, 308.

[134] *Cf.* Consul C. B. Hurst in *U. S. Consular Reports*, January, 1908, p. 156.

[135] 1898, p. 306.

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sively to one article and if the market for that commodity is disturbed or lost the whole colony is thrown into demoralization. A familiar example is the distress of the West Indies incident to the competition of beet sugar with cane sugar. The West Indian planters had counted upon the price of sugar always remaining high, and business economies were not practised. When the price of sugar fell, they were not in a position to meet the new situation brought about by the bounties to beet-root sugar on the continent of Europe. The planters mortgaged their estates, yet did not introduce new machinery or other economies, but merely waited for a change of luck to improve the situation.[136] Again, for more than a half century the prosperity of Ceylon has been dependent upon the development of two leading products—coffee and tea. From 1837 to 1867 attention was directed almost wholly to the cultivation of coffee. The profits from the industry were almost fabulous in amount. The year of greatest export was 1874–1875, when almost one million hundredweight of coffee was shipped from Ceylon. But a sudden and severe decline in the industry set in owing to a parasitic growth on the leaf of the coffee plant. In ten years the coffee fields were desolated. In 1886–1887 only 150,000 hundredweight was sent to the London market. Between the withered rows of shrubs tea was planted and the new industry developed rapidly,[137] but the prosperity of Ceylon still rests upon one product. To cite another example, the exports of British North Borneo are quite typical. The list is quite an extensive one—tobacco, timber, cutch, gutta-percha, sago, rattans, india-rubber, birds'-nests, camphor, trepang, salt fish, damar, hempseed, pearls, mixed shell and copra. But the only things to be regarded of any considerable commercial value are tobacco and timber. The rest are merely jungle produce, and they are chiefly absorbed by the Chinese who depend upon the Dyaks to secure the rattans, birds'-nests and so forth for them. It is not a trade that admits of any great expansion without producing a scarcity of the articles in question.[138] In South America

[136] Bigelow, *Children of the Nations*, 188.
[137] Greswell, *British Colonisation*, 232–235.
[138] Colquhoun, *Mastery of the Pacific*, 280–281.

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gold and silver proved the ruin of Spain, sugar played the same part in Cuba, and in the Dutch Indies spices were the origin of trouble.[139] Morris says:

"In the work of colonization, every nation undertaking the task seems to single out some article of production as the object around which its care and solicitude turn; it is *the* commodity from which wealth is anticipated; all else is subordinated to it and, as compared with it, considered valueless. The government, zealous to promote the single coveted specialty, surrounds its cultivation or extraction with detailed regulations, retains an exclusive control over it, and expects to derive from it an exaggerated profit. Generally the hopes so highly strung are vain and deceptive. A great output may be attained, vast fortunes made, immense revenues raised, a monopoly established, glory and magnificence may ensue; but invariably, like the golden apple so beautiful to the eye, this success is corroding the heart, corrupting the character, and implanting in the national constitution the germs of senility, decay, and decline."

To overcome this difficulty of a one-product system England, Netherlands and, in more recent years, France and Germany have taken some steps toward a systematic study of colonial conditions with a view to improving agricultural methods and encouraging variations in crops. But a considerable period of time must elapse before these efforts bear much fruit.

The second obstacle to the development of tropical and indeed of all colonial trade is the scarcity of capital for investment as compared with the needs of the colonies. Production in Portuguese Angola is greatly impeded by lack of communication. The crying need of the German colonies is also for more railroads. The French colonies will require a great deal more money expended in transportation facilities before any great results in trade can be expected. "What Tunisia needs is capital, and everybody knows it."[140] The French, it is sometimes said, lack patience in waiting for results and desire to profit immediately

[139] Morris, *History of Colonization*, 1: 325.

[140] Mansfield, *In the Land of Mosques and Minarets*, 69.

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by colonial trade. Yet there is some truth in the English charge that the French would rather that their colonies would remain undeveloped than have them developed by other trade than their own. The English, on the other hand, believe that if their colonies prosper the mother country will get her share of the benefits.

The third obstacle to the development of tropical commerce is more difficult to surmount than the two just mentioned. It is the lack of a reliable labor supply. Authorities differ greatly as to the difficulties in the way of the solution of this problem. The importance of the question none deny. The economic history of the tropics for the last two or three centuries is chiefly an account of the efforts of landowners to secure an adequate labor supply. Since the abolition of slavery the sources of labor have been free negroes and imported laborers, chiefly Chinese and East Indians. Theoretically there are four possible sources of labor supply for the tropics: white, negro, East Indian and Chinese. Yet until the white man gives more promise of being able to live even a quiet and nonstrenuous life in the tropics, it is of little use to consider him as a possible source of labor supply in developing tropical colonies.[141] Ireland says that in "no part of the tropics can manual labor be performed by white men, and it has always been found that, in places where the laboring classes are composed of colored men, only the very highest occupations will be taken up by white men. A natural limit is thus set to the proportion of white men which can be supported by any community in the tropics."[142] According to Bigelow the white man has never shown any great taste for arduous manual labor in the tropics, yet one reason why he has not attempted this is the simple one that his services have had a greater economic value if devoted to the superintendence of black labor than if he attempted the heavier work. White sailors, he says, keep on with their work in the tropics the same as in cooler climates and "soldiers fight as well in India as in Northern China." The excessive mortality

[141] *Cf.* Ireland, *China and the Powers,* 15.
[142] Ireland, *Far Eastern Tropics,* 17.

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in hot climates among white troops, he claims, generally is caused by bad habits of living, the inexperience of the officers and the generally unsanitary conditions of the country and not by the heat.[143] The most convincing evidence that the white man cannot hope to become acclimated to the tropics is presented by Woodruff in *Effects of Tropical Light on White Men,* in which he shows that the white man is gradually but surely eliminated under excessive stimulation of light.

Turning to the free blacks as a possible source of labor supply, experience teaches that for the most part they have proved unreliable.[144] Frequently it is said that native labor would be adequate "if properly encouraged." In British East Africa it is claimed that where the settler is fair and just in his dealings he has little or no trouble in securing labor.[145] The division of land into small holdings is also frequently beneficial in stimulating the native to work. The complaints of labor scarcity come chiefly from large plantations. This shows that the primitive man, like the average person, prefers to be his own master. It was hoped that education would stimulate native labor, but it has been found in the tropics that where education, other than technical or industrial, has been most freely provided, natives are least inclined to work.[146] It is believed by some that the development of communication and transportation will do much to remove labor difficulties, because it will render the colonies more prosperous and greater inducements in the way of pay will make the natives more willing to work. Increase in remuneration is the normal way of stimulating labor. Even a native recognizes the difference between working for something and working for nothing. Yet to offset this advantage it often happens that when wages are doubled native laborers instead of showing a greater willingness to work reduce their labor-time by half.[147] Ireland holds that, except in countries where pressure of population is

[143] Bigelow, *Children of the Nations,* 293.
[144] Ireland, *China and the Powers,* 14–15.
[145] Eliot, *East Africa Protectorate,* 50.
[146] Ireland, *Far Eastern Tropics,* 136–137.
[147] *Ibid.*

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felt, the natives will not devote themselves to steady labor of any kind. The importance of this generalization, if true, is realized when it is considered that outside of India, Java, Barbados, Cuba, Porto Rico and a few islands of small importance, the pressure of population is not felt and the native can secure the means to satisfy his few wants with very little effort.[148]

Sometimes it is the conditions of labor rather than aversion to labor as such that discourages native efforts. One reason why it has been so difficult to secure reliable and cheap black labor in Delagoa in spite of the fact that the natives are anxious to earn wages is because of the enforced conscription practice peculiar to the Portuguese. The Portuguese indeed are feared more than the Boers.[149] The following authoritative view is well worth considering: "The core of most problems connected with the opening up of Africa is cheap labor. The negro, as compared to the European and Asiatic, is fitful in industry. He can put fire, energy, strength, skill, intelligence, into his work if he is in the mood, if he is attracted by an immediate, tangible reward, or is spurred on (as he can be so easily, poor soul!) by affection or admiration for the white man. But work for work's sake in his—to him—delicious climate and well-provided country is no ideal at present native to negro Africa. And then he has been so often cheated. He has been the butt and the prey of the shrewd Caucasian since the uprising of Semiticized Egypt eighty centuries ago and down to the last rogueries of South African mine managers. But he *will* work—and none better—if you take him into partnership, convince him of your honesty and treat him fairly."[150]

But it would take time to build up a native labor supply even on the hypothesis that the natives would respond to an increase in pay and more favorable conditions of work, and capitalists are usually impatient to establish industries and greedy to secure returns on their investments. The tendency is to seize upon forced

[148] *Ibid.*, 133–134.
[149] Bigelow, *White Man's Africa*, 52.
[150] Sir Harry Johnston, *George Grenfell and the Congo*, 1: 486.

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native labor or, more recently, imported labor as the solution of the problem. Owing to the increased facilities for communication and transportation labor is more mobile than ever before. It is not improper to speak of a cosmopolitan labor supply, much as we now speak with regard to capital, of a cosmopolitan loan fund. The supply of East Indian coolies is practically unlimited and they have enough confidence in the British government to induce them to set out for the most distant plantations provided they sail under the British flag.[151] The Chinese furnish another and equally abundant supply of labor for colonial purposes. The Chinaman shows the capacity and readiness to take the place of the negro and the capacity to fill any position from coal-heaver to banker.[151] But there are difficulties in the way of importing labor. In the first place the imported laborer may compete with the white man and cause endless trouble. We have seen the steps taken by the Australians against the admission of natives of India to their country. In the second place, the imported laborer tends to displace the native and causes new problems to arise. Colquhoun says:

"On the one hand we have lands waiting for the labourer, we have whole islands lying fallow for want of hands to till them, we have minerals waiting to be exploited. On the other hand we have the omnipresent Chinaman, ready to swarm into these lands. It seems an extremely simple situation, but mark the complications. In some of these countries white men cannot work. Well and good! The Chinese will work under his supervision, but—the ever present 'but'—there is already a native population, who ought not to be jostled out of their place on the land as the Chinese will inevitably jostle them. In others the white man can do a certain amount of work, and here he finds that the Chinese undersell him."[152]

The more closely one studies the labor situation the more is he impressed with its complications and the less optimistic does he become of an immediate solution which will give any great im-

[151] Bigelow, *Children of the Nations*, 308–309.

[152] Colquhoun, *Mastery of the Pacific*, 308–309.

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petus to the commercial development of the tropical colonies. The practical question then is, Will the native peoples, taking them as we now find them, prove good customers for American and European goods in particular? Ireland says:

"A moment's reflection serves to satisfy us that whatever increase may be looked for in the trade of the European countries, of North America, and of non-tropical Australasia, a vastly greater proportional development may be expected in the trade of tropical and sub-tropical countries. The white man at home has reached such a high degree of efficiency as a producer and as a consumer that it cannot be foreseen that the rate of progress to be observed during the past century will be maintained during the century upon which we have just entered. The people of the tropics, on the other hand, are still in a very low stage of productive efficiency; and their value as consumers is proportionately small. I have shown elsewhere (*Trop. Col.*, 110, 111) that in the British Empire the productive efficiency of the tropical as compared with the non-tropical man is as 1 to 23, and that the value of the former as a consumer is as 1 to 17 compared with the value of the latter. It is certain, moreover, that in the tropics outside the British Empire—under less efficient forms of government, and with less protection for the products of industry—the economic value of the tropical man is even less than this.

"Concisely, the formula which I would deduce from the above facts is this: that the difference between actual and normally potential economic efficiency is so much greater in the tropical man than in the non-tropical man that it is reasonable to anticipate that the trade of the former could be doubled in the time which would be required to raise the trade of the latter by thirty per cent."[153]

Tucker[154] gives an interesting account of the effects of the construction of the Uganda Railway and the establishing of steamship lines on Victoria Nyanza, chief of which was "the way in which the whole of the Lake region of Central Africa has been aroused

[153] Ireland, *China and the Powers*, 8–9.

[154] Tucker, *Eighteen Years in Uganda and East Africa*, 2: 292.

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from its age-long slumber and electrified into life and action." "From regions round about Tanganyika on to Tabora, and away westward to the Congo State, the whole population has been aroused, and, just as in Uganda, streams of men are making their way to the nearest port on the Lake shore with their produce—bees-wax, hides, goat-skins, cotton, and rubber." Tucker also states that the enlarged market for native products has resulted in a considerable rise in the standard of living in Uganda. "The Kanzu, a long white linen garment, has, in the case of the men, taken the place of the . . . national dress, . . . lamp oil has become almost a necessity for all save the very poorest. Plates and dishes, cups and saucers, pots and pans, and enamelled ware of all kinds, find ready buyers. Lamps, watches, clocks, and even bicycles are being purchased to no inconsiderable extent by natives where enterprise in cultivating cotton and other produce has been rewarded with success."[155] It is generally found, however, that natives buy chiefly ornaments, calicoes, prints, and the cheapest classes of goods, and after these simple wants are satisfied it is very difficult to raise their standard of life. Colquhoun's account of trade in the Pacific is typical: "The civilised Malays dress in cotton, but they are not a spending people, and the wilder tribes do not trouble about costume at all, or wear merely the native manufacture. They do not want furniture, for their houses are empty, and a grass-mat is all they need for bed, table, or chair. Their one extravagance is jewellery, and this they buy, cheap and nasty, from the Chinese traders, who get it, cheaper still, from Birmingham or 'Made in Germany.'"[156] The conservatism of primitive peoples also works against raising their standard of living or changing established tastes. For example, Chinese brick tea, the refuse of the tea industry, is the universal drink in Tibet and neither Bhutia, Tibetan, or Tartar will use any other in spite of the strenuous efforts of traders to introduce the tea of civilization into these vast tea-consuming areas.[157]

[155] Tucker, *op. cit.*, 293.

[156] Colquhoun, *Mastery of the Pacific*, 281.

[157] Holdich, *Tibet, the Mysterious*, 139–140.

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Another difficulty in the way of increasing native trade is the fact that most natives want what the government does not care to furnish them, firearms and spirits. The decline of native races from the use of intoxicants is a fact that must be reckoned with from whatever standpoint the future of the tropics is regarded. "It matters not at what end or part of the scale of colour the man may be—whether he is a woolly-haired, baboon-jawed nigger from Central Africa, a grave, intelligent, educated Maori of New Zealand, or a gentle child-like native of Tahiti, barely *cafe-au-lait* as to colour—all the same, and all the time, spirits are sure to convert him, temporarily, into a raging beast, and, in the long run, to wipe out him and his kind altogether."[158] Lorenzo Marques in Portuguese East Africa with its population of 1,200 whites has supported ninety drinking shops, a feat that could only be accomplished by the aid of native patronage chiefly.[159] According to Nevinson the whole population of Angola is degenerating, the people becoming bloated and stupid, and the saying common, "You see no fine old men now." This condition is likely to remain unchanged so long as the Portuguese find that rum plantations of cane or sweet potatoes pay better than others.[160] The liquor laws in Tahiti under French rule are also defective and a further impetus is thereby given to the decline of the native population—an encouragement that is not at all needed since there is already a pronounced tendency among the people of almost every island in the Pacific to diminish in numbers.[161] British East Africa and Uganda lie within the zones in which the importation of spirituous liquors is forbidden and the restrictions are very well enforced as far as European beverages are concerned, but the natives manufacture many intoxicating liquors from such things as palms, sugar-cane, and honey.[162]

In the discussions on colonial trade in general, a point seldom

[158] Grimshaw, *In the Strange South Seas*, 22.
[159] Bigelow, *White Man's Africa*, 67–68.
[160] Nevinson, *A Modern Slavery*, 145–146.
[161] Grimshaw, *In the Strange South Seas*, 23.
[162] Eliot, *East Africa Protectorate*, 182.

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touched upon is the fact that after the mother country has built up a large trade with her colonies, no assurance can be given her that she will retain the advantage. The trade of the world is ever in a tumultuously dynamic condition. So delicate are the adjustments, events of seeming insignificance may cause great shiftings in the currents of commerce. (1) The disturbance may be brought about by a cheapening of transportation, its greater efficiency, or by the opening up of new routes. The opening up of the Suez canal not only disturbed trade in Syria and adjoining countries but caused a world readjustment.[163] Similar results may be expected from the opening of the Panama canal.[164] (2) Discoveries and inventions may cause a new product to displace an old and staple one and thus upset established trade arrangements. Yucatan has discovered a plant which is said to make as good rope as now comes from Manila. Liquid fuel, a residue from the petroleum wells of Netherlands India, is now being used by many Dutch steamers.[165] During the phylloxera period in France the taste of the consumer had changed and an invention of a manufactured product broke into the sale of French wines. (3) Changes in the area of crop culture, which cause shiftings of trade, are occurring continuously. During the French phylloxera troubles, vine-growing was started or developed in Italy, Spain, Hungary, southern Russia and Algeria.[166] Tobacco is being raised in Europe to prevent European dependence upon the United States. Tea is being tried in Texas and Mexico. Cocoa plants are being grown in Samoa. The United States is cultivating the silk worm instead of leaving the industry to the Orient. The United States in turn must, in the future, face an active competition in the cotton trade of the world. German colonial enterprise in the cotton trade is meeting with good success so that Togoland and German East Africa

[163] *Cf.* Guy, "French Colonial Expansion in the Nineteenth Century," in *International Monthly,* 4: 516–517.

[164] *Cf.* Masuda, *Japan,* 122; *U. S. Monthly Consular Reports,* February, 1905, 137.

[165] *U. S. Monthly Consular Reports,* February, 1905, 54.

[166] Lebon, "The Situation of France in International Commerce," in *International Monthly,* 3: 257.

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may now be considered cotton-growing colonies. England, France, Italy and Belgium have followed Germany's example. Lately Portugal, Spain and the Netherlands have begun cotton culture.[167] (4) The industries upon which the imperial trade is built up may experience a decline. Many examples of such cases might be given. To-day Madagascar is half-ruined because of the exhaustion of the soil[168] and commerce must suffer in consequence. The camphor trade of Formosa was very valuable at one time but, under a short-sighted policy, it was farmed out; this led to the employment of wasteful and injudicious methods whereby the trees were so damaged that the amount of camphor obtained was almost nothing.[169] In Fiji the cultivation of coffee has been almost entirely abandoned owing to the attacks of a little insect called the *Acarus coffeae,* which destroyed the leaves.[170] The cotton and indigo industries, for which the West Indian island of Tobago was once famed, have disappeared.[171] In the Madeira Islands sugar was at one time the most important industry; then in 1775 the wine trade occupied first place.[172] In the Canary Islands the cochineal industry suffered from competition with aniline dyes and exports of cochineal fell from £789,993 in 1869 to £50,877 in 1892.[173] (5) Competitors may appear in the field strong enough to wrest the colonial trade from the mother country in spite of the latter's position of vantage. For a century the Portuguese enjoyed a monopoly of the rich trade with the East Indies but in 1595 a Dutch ship appeared on the scene and the monopoly was broken. England has long monopolized markets in China, especially along the line of cotton manufactures, but now the Japanese show a strong tendency to encroach upon this field. And Japanese rivals are not to be considered lightly judging from their success in wresting from Eng-

[167] "Cotton Culture in German Colonies," in *U. S. Monthly Consular Reports,* December, 1904, 103.

[168] Seignobos, *Contemporary Civilization,* 363.

[169] Colquhoun, *Mastery of the Pacific,* 394.

[170] Greswell, *British Colonisation,* 226–227.

[171] *Ibid.,* 15.

[172] Brown, *Madeira and the Canary Islands,* 268.

[173] *Ibid.,* 278–280, 266.

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land her carrying trade in Asiatic waters. Recently the chairman of directors of the Peninsular and Oriental Steam Navigation Company at the London meeting announced that there would be no dividend for the year just past because of Japanese competition—an announcement which is "pregnant with meaning and prophetic of greater changes yet to come."[174] When China emerges from the darkness the chances are that she will demand a share of the markets of the world and even take possession of much additional territory.[175] All this simply means that no trade, whether it be between the mother country and her colonies or between two foreign countries, can be regarded as a certain factor upon which reliance can be placed for estimating the value of trade in the future.

There is also reason to believe that the proportion of imperialistic trade which is due to political relations decreases as the colony becomes older. The knowledge of world conditions is continually becoming more diffused on account of faster, cheaper, and more efficient transportation which brings all countries into closer relations with each other. The result is that the sentiment regarding the security of a particular flag is becoming less and capital is becoming denationalized. Aside from this, as a colony becomes more prosperous and more secure, foreign capital and foreign trade is attracted to it. Then the need for large governmental investments decreases as a colony is developed and trade shrinks accordingly. The tropical and sub-tropical colonies are so largely unfit for settlement that, after the first opening up of a colony during which period officers are installed and traders flock in, there is little growth of white population to be anticipated and therefore trade is not encouraged to follow the citizen. The community of tastes which tends to confine trade to the mother country is also of waning importance. The increase of trade occurs chiefly, not in articles in which tastes differ, but rather in standardized articles such as wheat, cotton, wool, gold, oil, calicoes, yarns and fruit.[176] Besides as a colony becomes

[174] Allen, *Things Korean*, 254–255.

[175] Jack, *Back Blocks of China*, 257.

[176] *Cf.* Caldecott, *English Colonization and Empire*, 187.

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older *l'esprit colonial* always develops, and less and less regard is given to the origin of goods and more attention is paid to the adaptability of goods to needs. While the original settlers in a colony may be supplied by the mother country, succeeding generations are born in the new country and the sentiment which turns trade to one's native land is now lacking between mother country and colony. "When colonies were peopled by emigrants from home there was no occasion to create sentiments on imperial lines, the colonist was an Englishman and had no more need to proclaim the fact than the man in Cornwall. His descendants, however, are not Englishmen, they are Australians, Canadians, South Africans, or whatever the colony may be, with essentially different interests. A stream of fresh emigrants serves to preserve something of the Old Country sentiment, but the native-born Australian is Australian, reared under a different climate and different conditions." [177]

If colonies are successful, a disadvantage may arise in the competition between the mother country and her possessions, for every new area developed means either a new market for goods or a new competitor in the field. The French colonies have been greatly antagonized by the French protectionists whenever the colonies have begun to compete with France. A few years ago the Indo-China bank assisted in establishing spinning and weaving mills in Pondicherry, Indo-China. The sentiment of at least a part of the French people was voiced by a journal, the *République Française,* thus: "We place the prosperity of France above that of Pondicherry. If France has sacrificed so many men and so much money in the conquest of Indo-China and Madagascar it was not to procure a market for yarns and stuffs manufactured at Pondicherry." [178] France has therefore adopted custom house measures to tax French products manufactured in Indo-China and Madagascar.[179] French agriculturists are also bitter against

[177] Jane, *Heresies of Sea Power,* 181.

[178] Cited by *Economist* (London), 1898, p. 1659.

[179] *Cf.* Lebon, "The Situation of France in International Commerce," in *International Monthly,* 3: 269.

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the colonies when they come into competition with them. Large sums are spent for salted and preserved meats for the army and agriculturists desire that this shall all be spent for French products and not colonial. This sentiment was voiced by a deputy who said that it was never intended that French farmers who paid the greater part of the taxes should be sacrificed to the interests of a few speculators in the colonies.

Naturally, the older the colony the more likely is it to compete with the governing nation. The older British colonies, especially Canada, are beginning to develop considerable skill in manufacturing. It was the textile manufacturers in the Dominion that offered the strongest resistance to a preferential tariff in favor of the mother country.[180] The Colonial and Indian Exhibition of 1886 revealed, at that early date, very surprising ambitions in the direction of manufacturing. Although the English colonies contain millions and millions of acres of unoccupied land, they furnished at this exhibition great displays of samples of home-manufactured clothes, hosiery, machinery and billiard tables. The desire of the colonies to foster home manufactures is shown by their tariff schedules. Every responsible colony but one (New South Wales) has a more or less severe tariff. In Victoria, not only are watches and clocks taxed, but such essentials as agricultural machinery, hansom cabs, waggonettes, buggies, medicines, silk manufactures, articles of apparel and coal. The Representative and the Crown colonies are under imperial control, and for this reason have been prevented from adopting any protective measures. India, for example, has not been allowed to protect her own cotton goods against Lancashire although some maintain that it is England's duty to regard India's needs.[181]

[180] Root, *Trade Relations of the British Empire*, 46.

[181] Caldecott, *English Colonization and Empire*, 180–181; *cf.* Kirkpatrick, "Supplementary Chapter," in Caldecott, *op. cit.*, 283.

In 1894 when the Indian customs tariffs were revised "a small duty was imposed on (among other goods) the cotton goods imported into India. No countervailing excise duties were imposed by the Indian Government on cotton fabrics or on cotton yarns of a lower 'count' than 'twenties'—the Indian mills mostly manufacturing yarns of low counts.

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India, nevertheless, is becoming a more and more formidable rival to Lancashire. During the past twenty-five years she has been passing through the first stages of an industrial revolution. The construction of railways and the resultant opening up of the interior, the removal of export duties and the improvement of ocean navigation have greatly increased the production and exportation of cotton yarn and calico. Although Indian labor is inefficient, this is off-set by its cheapness. To-day "Bombay is no longer merely the gate of the golden East, the land of gems, drugs and spices: she is a busy manufacturing city, bristling with smoky chimneys."[182] In 1907 the first attempt was made to establish iron and steel works in British India. The enterprise, with a capital of $7,725,000, was supported by a rich firm in Bombay, aided by other wealthy individuals, and by the Government of India.[183]

An imperialistic policy involves economic loss to a country in that the collision of national interests resulting makes it more difficult than it would otherwise be for the countries concerned to enter into friendly trade or other relations with foreign nations. It is the British occupation of Egypt that has made the disputes

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An agitation was immediately set on foot by the Lancashire mill interest, as was only natural, in England, where the ultimate political power with respect to India rests. It was asserted that unless the countervailing excise was imposed, a sort of bounty would be created in favour of the Indian mills as against Lancashire, which would be against the declared policy of free trade pursued by the Government. The countervailing excise duties were therefore imposed, but they do not apply to the hand-weaving industry. Now it is contended by the Indian mill interest . . . that the Indian mills do not really compete with the Lancashire mills in the classes of goods produced. It is estimated that only one-fifth to one-sixth of the yarn produced in Indian mills is of counts above the 'twenties,' while only one-eightieth of the yarn imported from the United Kingdom was 'twenties' and under. Thus the products of the Lancashire mills and the Indian mills do not compete to any great extent. . . . In such matters, however, the hands of the Indian Government are tied by the influences that rule in the political atmosphere in the centre of the Empire." Yusuf-Ali, *Life and Labour in India,* 169–170.

[182] Kirkpatrick, *op. cit.,* 283.

[183] *U. S. Monthly Consular Reports,* December, 1907, 156–157.

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between the French and the English over the Newfoundland fisheries so hard to adjust.[184] French occupation of Tunis accounts for seventy-five per cent of the Italian's animosity toward the French.[185] Giddings, on the other hand, holds that the possession of territory may be an entering wedge for securing enlarged trade opportunities in a given region. He says:[186]

"The demand for liberal trade opportunities in the East will not be respected by China and her great overlord, Russia, merely because we are able to show her how valuable such privileges have been and may become to them and to ourselves. They will think of us as our protectionists have thought of them and of Europe—as a people afar off: and they will yield a more attentive ear to powers that, in delusive perspective, seem to be more important because they are nearer: All history points to the conclusion that in no way can we make our demand for greater trade facilities in the East so effective as by maintaining our sovereignty over some territory, however small, in that quarter of the world. If we have possessions there, if we have difficulties and responsibilities to meet there, our own attention will not be withdrawn from the opportunities there offered; and the Oriental powers will not themselves forget our existence and our resources. In short, unless we are prepared to see the Oriental trade that we now enjoy slip out of our hands, and unless we are oblivious to the possibilities of its increase, we probably must retain possession of some territory in the Western Pacific."

Finally, is it necessary to annex territory to secure the markets of that territory? Free trade economists who distinguish between a territorial empire and a trade empire answer the question in the negative. It is true that nations, as we have seen, are becoming increasingly dependent upon the tropics for supplies, but such trade does not confine itself to the mother country and possession. Outside countries get a share also. The tropical

[184] Greswell, *British Colonisation*, 56.
[185] Mansfield, *In the Land of Mosques and Minarets*, 59.
[186] Giddings, *Democracy and Empire*, 283.

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and other regions will be developed if stability of government is assured that capital may safely invest. It is of small moment to the commercial world what nation plays the part of policeman so long as a good job of policing is done. The present colonial trade situation may be summarized in this way: "On the whole Adam Smith's dictum that while each nation has managed to engross the inconveniences of a colonial empire, the advantages it has been compelled to share with the whole world, is just as true to-day as it was in the century before his time. New colonies founded to expand trade buy as largely from foreign nations as from the mother countries, while the imperial expenditures on them and in them often exceed the sum total of all their trade."[187]

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[187] Davidson, *Commercial Federation and Colonial Trade Policy,* 140.

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Ibsen's Symbolism in "The Master Builder" and "When We Dead Awaken"

BY PAUL H. GRUMMANN

William Archer in the introduction to his translation of *When We Dead Awaken* says: "But to his sane admirers the interest of the play must always be melancholy, because it is purely pathological. To deny this is, in my opinion, to cast a slur over all the poet's previous work, and in great measure to justify the criticisms of his most violent detractors. For *When We Dead Awaken* is very like the sort of play that haunted the anti-Ibsenite imagination in the year 1893, or thereabouts. It is a piece of self-caricature, a series of echoes from all the earlier plays, an exaggeration of manner to the pitch of mannerism. Moreover, in his treatment of symbolic motives, Ibsen did exactly what he had hitherto, with perfect justice, plumed himself upon never doing: he sacrificed the surface reality to the underlying meaning."

The misconception at the bottom of this statement is probably due to a onesided acceptance of the poet's insistence that his plays are not to be taken symbolically. In spite of the poet's attitude we have had critics without number who have attempted to find symbolism in Ibsen's plays. *Hedda Gabler* as symbolical of a revolver is probably the most picturesque of these attempts. The church tower in *The Master Builder* has been so completely plastered over with symbolic meanings that we are not surprised that Ibsen cried out in self-defense.

It is not proper, however, to accept the poet's statements in matters of this kind, because he cannot possibly give an objective view of himself. He may state his intentions but he cannot define his own activity. Since no man can state to what extent he himself thinks symbolically, Ibsen cannot throw any real light upon himself in this respect.

If we take the term symbolism in its traditional sense, according to which a special significance is arbitrarily attached to stated

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things, it is quite clear that *The Master Builder* and all the plays of this period are not symbolical. If, however, we take the view that all thinking is symbolical to some extent, then *The Master Builder* at once becomes symbolical to a marked degree.

Our conceptions of individuals are not objective, but we throw all kinds of abstract notions into these conceptions. A person who has stolen thus becomes a thief to us. The application of such terms as thief, liar, lick-spittle implies a measure of symbolism in our commonest conceptions. But the process does not end here. A certain individual of our acquaintance may steal and in addition may betray marked characteristics of dishonesty. This may be so pronounced that whenever the thought of dishonesty comes to us, an image of our dishonest acquaintance appears to our consciousness. We visualize our abstraction in the terms of a concrete personality. This gives us the basis of psychological symbolism quite unlike the older formal symbolism which, in my opinion, must remain a superficial art-form.

Ibsen's habit of thought is essentially symbolical in this sense. He sees an individual who impresses him as a type and around this individual he arrays the peculiarities of the type.

So in Nora, we see the type of the woman of strong individuality; in Mrs. Alving, the well-intentioned opportunist who makes the best of a bad situation; in Dr. Stockman, the scientific idealist; in Hedda Gabler, the strong-willed, self-respecting aristocrat; in Borkmann, the constructive promoter; in Solnesz, the conceited promoter who does not learn his profession, but uses spurious and unprincipled means to bolster up his deficiencies. Indeed, it might be said that Ibsen has created a kind of twentieth century mythology in these figures since they reflect our ideas in regard to these various types.

Since this is the case, we cannot consider Ibsen a realist of the type of Arno Holz, but an impressionist, for he retouches and readjusts his figures in order to present the types clearly. To what extent he does this consciously can, of course, not be determined definitely, nor is it a matter of great concern. This emphasis of the typical qualities of his characters is so marked that

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it renders many situations in his plays very improbable, clearly a violation of the realistic technique. This tendency is particularly clear in *The Master Builder*. That Mrs. Solnesz should prefer her dolls to her children violates our notions of probability, but as an impressionistic device of portraying the slavish devotion of this woman to her past, it is very effective.

To put it mildly, the appearance of Hilde Wangel is anything but realistic, anything but probable. She comes exactly ten years after the crowning of the church, she has no trunk, she is mature and rather shrewd yet takes seriously an offhand promise given by a man who clearly was posing for effect. In spite of her silly confidence in his promise, this daughter of a village physician at once sees through all of the tricks of Solnesz, resolutely readjusts his life, drives him up the steeple and insists on having him put himself on the merit basis.

But the moment we look upon Hilde Wangel as one who has the characteristics that we have learned to associate with the ideal, the inconsistencies disappear. As Lowell puts it, "some day the soft ideal that we wooed confronts us." Just so Hilde confronts Solnesz. We have learned in this connection to think of the ideal as "claiming of thee the promise of thy youth." We have come to think of the ideal as exacting, cruel, relentless, persistent and objective. As a type figure Hilde at a stroke becomes thoroughly plausible to us.

The genesis of the figure in the poet's mind is clearly this: Ibsen had met some woman whose actions and utterances reminded him strongly of the conception that he had of the ideal. Upon this concrete basis he gradually, consciously or unconsciously, worked out the Hilde of the play, giving her additional characteristics of the type that had become fixed in his mind.

In the portrayal of Solnesz, it is again the typical that is of interest to Ibsen. It is not at all probable that a given master builder who did not have genuine professional ideals would be dishonest to the extent to which Solnesz is. Let us remember how many characteristics and circumstances Ibsen has connected with this figure: Solnesz has not only failed to prepare properly

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for his profession, but does not work on the real problems of architecture after he has become established; he realizes that he has not really deserved his success, therefore accounts for it to himself on the personal ground—he feels that he has hypnotic, supernatural power, that he can accomplish things by willing them; his feeling of guilt is extended to events for which he is not responsible and gives rise to the "sickly conscience"; the feeling that he does not deserve his success makes him afraid to build churches, for the highest ideal he substitutes an inferior one, but glosses over his act, that is, he hypnotizes himself into believing that the building of homes is better than the building of temples; so definite does this feeling of guilt become that he fears youth and experiences a physical reaction every time a knock is heard at the door; he sells himself for a business chance and although he is conscious of his guilt, he keeps on sacrificing his wife and himself to the demon of success; with growing age the old ideals again make themselves felt, but he cannot rise to church building; he constructs a hybrid form—a dwelling with a tower—an architectural monstrosity.

A figure conceived thus is neither realistic nor probable, but the moment we look upon Solnesz as a type the exaggerations become as natural as they would be in an impressionistic picture or a high grade caricature. These types are then set over against each other as foils. So in Solnesz and Ragnar Brovik, Rubek and Ulfheim, Hedda Gabler and Mrs. Elvsted, Tesman and Lövborg, Ella Rentheim and Mrs. Börkmann, etc. etc.

On the whole, the interpreters of Ibsen have erred in looking too closely at details without reference to the basic idea of the play as a whole. "Sie sehen den Wald vor den Bäumen nicht."

The central thought of *The Master Builder* might be outlined in a few words as follows: A man who forsakes his highest ideals and attempts to find success by unworthy means will come to grief; he will again be confronted by his former ideals and these ideals will drive him to ruin. This central thought of *The Master Builder* continued to engage the attention of Ibsen, for we see it reappear in *When We Dead Awaken*. Before the last play was written Hauptmann's *Sunken Bell* had appeared.

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It is not rash to suppose that Ibsen's final study of this problem was affected by Hauptmann's solution. When Meister Heinrich feels the doubts taking possession of him he says: "So mag der Satan dieses Werk vollenden, Kartoffeln will ich legen, Rüben baun, will essen, trinken, schlafen und dann sterben."

Rubek does the same thing. He makes portrait busts for money, into each one of which he puts the features of some animal. He buys a villa, marries a young wife and decides to live without reference to his old artistic ideals.

This is the more external relationship, for Ibsen might have based this much upon his own *Master Builder*. But we have a different conception of the ideal which accords rather with that of the *Sunken Bell* than that of *The Master Builder*. Hilde remains steadfast and prods Solnesz up to the promise of his youth. In *Sunken Bell* Rautendelein goes to the Nickelmann when Heinrich forsakes her. The conception clearly is that an ideal degenerates when it is forsaken. This idea Ibsen works out consistently in *When We Dead Awaken*. Rubek casts aside Irene. She becomes totally depraved, yet when he meets her later he interprets into her all and more than all that she had ever been to him.

In *When We Dead Awaken,* the characters are typical just as they had been in *The Master Builder*. Rubek is the artist who at first lives up to the highest demands of his art, but then resolutely turns his back upon his ideals, commercializes his art and buys the comforts of life scorned by the real artist. His wife Maja (type counterpart) is the village belle without higher aspiration, who marries for position. Ulfheim is the brute man, Irene is the woman typical of the degenerated ideal.

Hauptmann in *Sunken Bell* and *Und Pippa tanzt* gives us a naturalistic picture of the inner life of Heinrich and the director; hence Rautendelein and Pippa are presented entirely as conceived by Heinrich and the director. Ibsen in *The Master Builder* and *When We Dead Awaken* presents typical characters, but in addition points out that Solnesz and Rubek encounter in real life actual experiences which remind us strongly of a man's relation

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to his ideal. This experience is so typical for artists that we may look upon it as symbolical. Whether Ibsen succeeds in completely harmonizing typical characters with typical experiences is a question which can hardly be discussed adequately in the present paper. There is little difference between *The Master Builder* and *When We Dead Awaken,* except that in the latter play the problem stands out more clearly. Ibsen had learned not to overload his play with unessentials to a still greater degree than in the earlier play. As for surface reality, the latter play is superior to the former. The development of Rubek's statue into a group is far more plausible than Solnesz's home with the nurseries. Irene in the flesh is far more plausible than Hilde in the flesh.

If we apply the theory of psychological symbolism to both plays we find a solution which is absolutely satisfactory, one that does not break down at any point.

The distinction involved may be brought out by a significant example. Rubek speaks of the railroad employees at the stations through which they have been passing. "No one got out or in; but all the same the train stopped an endless time. And at every station I could make out that there were two railway men walking up and down the platform—one with a lantern in his hand—and they said things to each other in the night, low and toneless and meaningless." When, as has been done, we attach a symbolical meaning to these men and this lantern we lose ourselves in meaningless surmises. If, on the other hand, we conclude that Rubek interprets a meaning into them that answers to his own state of mind we are on solid ground. The men were really there for a very definite purpose, they spoke in low tones for a very good reason not always observed by our railroad men at night, their lantern served a very practical end, yet to this morbid Rubek the whole scene became symbolical of the aimlessness of his activity.

But to return to Archer. He calls *When We Dead Awaken* a piece of self-caricature. If Ibsen has caricatured himself in this drama, he has at some time turned his back on his ideals and has produced nothing but spurious art. This indeed would be

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"melancholy and pathological." But fortunately the analysis of a man who has not lived up to the best that is in him is not melancholy and not even pathological.

In 1882 Ibsen wrote to Björnson:

"So to conduct one's life as to realize one's self—this seems to me the highest attainment possible to a human being. It is the task of one and all of us, but most of us bungle it." Ten years later he wrote *The Master Builder* which is dominated by this thought. All of his subsequent plays are clearly based upon this idea, but in *When We Dead Awaken* he centers his attention once more upon this theme. He therefore called his last play the dramatic epilogue.

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Ibsen's "Emperor and Galilean" and Hauptmann's "Kaiser Karls Geisel"

BY EMILY GERTRUDE MOORE

Kaiser und Galiläer[1]

Ibsen, writing to his friends in reference to *Kaiser und Galiläer,* spoke of wrestling, year after year, with the "Ungeheuer Julian." One feels that he chose his term wisely; the work is "ungeheuer." It consists of two five-act dramas, "Cäsars Abfall" and "Kaiser Julian." The central figure is Julian the apostate; the action deals, as is suggested by the title, with his conflict against Christianity.

The first drama, "Cäsars Abfall," is the stronger and more convincing of the two. Ibsen has gone skillfully to work to make clear all the forces that have moulded Julian. We are made to see why and how this lad, once possessed of a fervor of belief that made him a missionary among his playfellows, should reject his boyhood faith and turn to the religion of the past and the doctrines of pre-Christian philosophers.

His uncle, Constantios, is the official champion of Christianity. Yet he shrinks in terror from the sacramental wine; "it sparkles in the golden goblet like serpents' eyes—bloody eyes!" He is haunted by eleven shadows—Julian's father and mother, with nine others of his race, who were murdered in a single night, that Constantios might be secure upon the throne.

All around him Julian sees doctrinal bickerings, bigotry and self-righteousness. Moreover Christianity is, to him, a religion of fear, opposing a stern "thou shalt not" between man and every natural impulse; a religion that shuts out all joy and beauty from this world and bids man build all his hopes upon the world to come.

[1] The author's references are all to Paul Hermann's German translation of the play which forms Vol. 5 of Ibsen's *Sämtliche Werke in deutscher Sprache.* Ten vols., Berlin [1898–1904].

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Hence, to him, Libanios' words call up the vision of an ideal. "Es gibt eine ganze herrliche Welt, für die Ihr Galiläer blind seid. Da ist das Dasein ein Fest inmitten Bildsäulen und unter Tempelgesängen, mit vollen schäumenden Schalen, und mit Rosen im Haar."

Yet when he has drained to the dregs all that Libanios can offer him, he is not satisfied. "Ich musz leben, Gregor,—und dieses Treiben hier an der Weisheitsschule, das ist kein Leben." The wisdom of books has become mere prating to him. "Bücher nützen mir nichts—nach Leben hungert mich, Zusammenleben mit dem Geist—von Angesicht zu Angesicht! Ward Saulus sehend durch ein Buch? . . . Geschriebenes, das ist nicht Wahrheit für das Fleisch. . . . Es musz eine neue Offenbarung kommen. Oder eine Offenbarung von etwas Neuem."

From Maximos, the mystic, he hopes to find a solution of the problem. It is Maximos who first suggests to him the idea of a "Third Kingdom," which is to be founded upon the tree of knowledge and the cross. It is to have its source in Adam's Garden and in Golgotha. Julian conceives the idea that he is to be the founder of this Third Kingdom, and the rest of his life is profoundly influenced by this idea. But the concept remains vague; it fills Julian with a delusion of greatness, but it never inspires him to any definite, persistent and constructive course of action.

At the end of "Cäsars Abfall" Julian, who has hitherto vacillated between the conflicting claims of Christianity, paganism, Greek philosophy and mysticism, definitely cuts loose from Christian ideals and inspiration. Up to this point he has vaguely intended to carry out the mission predicted by his boyhood friend, Agathon, and urged upon him by Gregory and Basilios, and become the restorer of a purified Christianity. From now on Marcus Aurelius becomes his inspiration, and the customs of the ancients his law of conduct.

Archer suggests that while Ibsen wrote "Cäsars Abfall" in full sympathy with Julian, he ultimately came to realize the absolute inferiority of paganism to the religion Julian would supplant and also realized that he had nothing better to offer in its stead.

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Hence, in "Kaiser Julian," he wrote with a different point of view, so convinced that Julian was of necessity foredoomed to failure that he even "loaded the dice" against him, and made him out to be much worse than history gives us any warrant for supposing him really to have been.

Whether or not we accept this suggestion, there is no denying the inferiority of "Kaiser Julian" to "Cäsars Abfall." The second drama might with appropriateness have been called "Julian's Downfall," for he comes eaten up with childish vanity, he lends a ready ear to flattery, he condones the persecutions of the Christians and reconciles it with his idealization of Marcus Aurelius by the flimsiest and most insincere of sophistries. He is seized with the "Cäsaren-wahn." To his courtiers he is an object of derision, to his Christian subjects a demon of terror. At a time of general famine he pays no heed to his starving people, but goes about making sacrifice, even though the crowd jeers at his heels. As a rebuke to the frivolity of his courtiers he goes about clad in tatters and boasts that his unshorn beard swarms with vermin as the thickets swarm with game. To all criticism and antagonism he replies by writing interminable "Schriften," which he insists upon reading to his ennuied courtiers, and which but expose him to fresh derision.

Yet through all failures and humiliations he retains his "Cäsaren-wahn." Even after he has admitted to Maximos that the "Galiläer" is a living and conquering force in the hearts of men; even when, cast down by the failure to rebuild the Temple, he is ashamed to show himself again upon the streets of Antioch, he still clings to the delusion. He believes that through the Persian war he will yet win back all that he has lost, fulfil the prophecy of a Messias, and possess the world as a spiritual and physical ruler.

This war completes his undoing. He is tricked by Persian craft into burning his fleet and cutting his army off from its supplies. When, after weeks of wandering and privation, his army and the Persians come into conflict, he falls. But his fatal wound is dealt by Agathon, the friend of his youth, the convert of his

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early zeal, who has been rendered insane by long-continued tortures.

Kaiser und Galiläer is a tremendous piece of work, yet it abounds in faults which the critics have not been slow to point out. It is, to a certain degree, formless and unorganized. There are scenes of great dramatic power. There are also long arid stretches that tax the reader's patience to the utmost. "Characters in which we have begun to be interested, like Sallust, disappear entirely and for no reason, while to other less important ones far too much space is granted" (Reich). The reader is bored by unnecessary repetitions. More than one scene of real dramatic power is spoiled being re-echoed. The illusion of reality is largely lost: one feels always that Ibsen is intent upon working out his thesis, though this thesis or guiding idea is itself obscured by the multitude of details.

Archer, as well as other critics, has pointed out that Ibsen worked over the historical sources of the play very carefully. He even put into Julian's mouth certain passages from his writings. Ibsen himself laid special emphasis on this. He wrote that he was holding himself strictly to the historical aspect, that his drama was "realistische Dichtung" entirely and throughout, that he had seen the characters in the light of their time.

The historical accuracy of "Cäsars Abfall" seems generally to be granted; but as has been said before, Ibsen departs from history in "Kaiser Julian," and makes Julian worse and more contemptible than he really was. Archer claims that there is no historical warrant for representing Ursulos as the victim of Julian's offended vanity. He says also that Julian was not in reality a bigoted and relentless persecutor of his Christian subjects. Ibsen also exaggerates Julian's failures and humiliations. Jovian was not in reality an eye witness of the failure to rebuild the Temple at Jerusalem, and so converted to Christianity. The temple of Apollo was destroyed by fire, not by an earthquake brought on by the curses of a Christian bishop. Julian's conduct of the Persian war was not so blinded by folly and superstition as Ibsen represents.

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Certainly Ibsen was too thoroughly acquainted with the historical material of the period to have departed from it unconsciously. He must have done so with deliberate purpose. It is possible that he did it to make Julian appear more unequivocally as the instrument of the *Zeitgeist*. Brandes and Reich both incline to put forth the idea that Julian is so represented.

According to this theory Julian was indeed a chosen instrument to fulfil a particular and definite mission—the regeneration of Christianity. He might do this either positively or negatively, but the mission itself he could not escape. "Es stand Julian frei, der eifrigste Vorkämpfer oder der glühendste Hasser des neuen Glaubens zu werden. . . Julian erfüllt gegen seine Absicht die ihm zugedachte Rolle als Erneuer des Christentums" (Reich). Ibsen's "conception of Julian is that by this persecution of his Christian subjects he became the real creator of the Christianity of his age, that is to say, its awakener from the dead" (Brandes).

Certainly the drama offers some support for this view. Looking back upon preceding events in the light of the final catastrophe, we can see that the whole current of Julian's life set toward one definite goal and that he was carried along in this current with or without his own volition. The many visions, signs and like phenomena upon which he placed so much dependence are capable of a double interpretation. It is clear, too, that whichever way he interpreted them, he was fated in the end to fulfil the destiny allotted to him by the *Zeitgeist*.

Agathon's vision and his message that Julian was divinely chosen to wrestle with the lions, influenced Julian to take the first decisive step—the step which set in motion the action of the whole drama. Agathon's interpretation of this vision would have made Julian the champion of Christianity; had he followed its warning and never again set foot in the capital city, the activity and purpose of his life, though not its final effect, must have been wholly altered. Julian's own interpretation, on the other hand, culminated in his becoming the bitterest antagonist of Christianity.

The revelations of the spirits called up by Maximos in the "symposium" are all darkly equivocal. But, looking back at them

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in the light of the following events, we can see that they too indicate Julian's destiny.

> JULIAN. Warum wurde ich?
> EINE STIMME . . . Um dem Geiste zu dienen.
>
> . . . . . .
>
> JULIAN. Was ist meine Bestimmung?
> DIE STIMME. Du sollst das Reich gründen.
> JULIAN. Welches Reich?
> DIE STIMME. Das Reich.
> JULIAN. Und auf welchem Wege?
> DIE STIMME. Auf dem Wege der Freiheit!
>
> . . . . . .
>
> JULIAN. Und durch welche Macht?
> DIE STIMME. Durch das Wollen.
> JULIAN. Was soll ich wollen?
> DIE STIMME. Was du musst!

Looking at it from this point of view, we get a fine instance of poetic irony when Julian says to Maximos—"Ich trotze der Notwendigkeit. Ich will ihr nicht dienen! Ich bin frei, frei, frei!"

When Leontes comes and offers Julian Cäsar's purple mantle, Julian interprets this as the first step toward the founding of the "Third Kingdom," and as such accepts the honor, against the protests of Gregory and Basilios on the one hand and of Maximos on the other.

The sybilline prophecy itself led Julian to destruction, because of the interpretation he placed upon its warning to beware of the "Phrygian Regions," for this impelled him to burn his fleet, and on this one step "Disaster followed fast and followed faster."

The same theory finds further corroboration in Makrina's question to Julian—a question which he evades and will not answer. "Und lebt er (der Galiläer) nicht in deinem Hass und in deiner Verfolgung gerade so wie er in unserer Liebe lebt?"—Maximos, looking down on Julian's lifeless body, sees in him a "sacrifice of necessity"; Makrina and Basilios an instrument of the Lord, a rod of correction, not to death, but to new life.

Brandes says that the spiritual lesson of the drama is that "only that doctrine which finds willing martyrs among its followers possesses any intrinsic value." I am not inclined to be-

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lieve that Ibsen wrote his drama for the sake of setting forth this idea. Certainly we cannot accept the converse or else we should have to admit that the "Holy Rollers" and like organizations of hysterical and deluded people have a sound basis for their peculiar creeds. Yet Julian did undeniably feel this lack in the best that his own philosophy could offer, for he says to a group of courtiers:

"Ihr nennt Euch Nachfolger des Sokrates, des Platon, des Diogenes. Ist einer unter Euch, der um Platons Willen freudig in den Tod gehen würde? Würde wohl unser Priskos seine linke Hand opfern für Sokrates? Würde Kyrton etwa für Diogenes sich ein Ohr abhauen lassen? Ihr tätet es wahrhaftig nicht!" And again to Maximos: "Was hat der macedonische Alexander, was hat Julius Caesar, gewonnen? Die Griechen und Römer sprachen von ihrem Ruhm mit kalter Bewunderung, während der andere, der Galiläer, der Zimmermannssohn, in warmen gläubigen Menschenherzen als der König der Liebe thront."

Julian's fatal weakness is that he has no resources within himself. The man who is to lift humanity on its way can be no more dependent on the externals of one outworn creed than on those of another. Julian rejected Christianity, but in its stead he could offer only the doctrines already laid aside in the advance of progress. As Maximos said, he tried to turn the youth back into a child; he lifted his sword against the forces of evolution. He derived his inspiration and resolution almost wholly from signs and portents. When these were lacking he shrank from action and cried out against being forced to stand alone. Thus he lacked all the essential qualities of leadership; for the man who is to found the "Third Kingdom," if any one such appear, must indeed "come in his own name," must have in his own soul some new and inspiring revelation of truth.

Kaiser Karls Geisel

In *Kaiser Karls Geisel* Hauptmann deals with a theme somewhat like that of *Kaiser und Galiläer*. The treatment, however, is so essentially different that the similarity of theme is not at once

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apparent. The difference in the art of the two authors is well illustrated by the contrast between the dramas in question. One feels that Ibsen wrote *Kaiser und Galiläer* for the sake of bringing out a particular idea; and that his characters are merely means to that end. But Hauptmann thinks in terms of living beings. His first concern is to put before us men and women who are true to life, and if we would understand their significance we must first know them.

The basis of *Kaiser Karls Geisel* is given in the following paragraph quoted by Hauptmann from *Le sei giornate* of the sixteenth century: "It is written that King Charles, whom the French calling the Great compare to Pompey and Alexander, during his reign fell deeply in love with a young girl, who, as it seemed to him exceeded in beauty every other maiden of the kingdom of France during those days. The king was fired with such love for her and had his mind so corrupted by her tender and wicked caresses, that notwithstanding the harm that would come to his fame and honor for such a reason, and having given up the thoughts of governing his kingdom. . . ."

Certainly Hauptmann entered upon no light task when he undertook to treat naturalistically the heroic and half-legendary figure of Charlemagne. Yet in the very opening of the first act he brings him before us, vitalized, real, convincing. We recognize at once all the traits made traditional by history. He puts in his spare moments memorizing the list of the "eleven free arts," and writing it—with difficulty—upon a waxed tablet. He is a keen administrator and a mighty warrior. But there is something more.

He is possessed by a strange and restless spirit. In spite of his long and brilliant career, there is something in his life that fails to satisfy him. He says with "selbst-ironie": "Ich bin ein Franke! Wer bestreitet's?—Frei! Wer leugnet's? ein Gefangener meiner Pflicht!"

The stern and simple code of duty that he has followed all his life seems inadequate to him now. The tasks that seemed all-important have grown trivial. With Solomon he is ready to say:

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"Wie alles eitel, ganz nur eitel ist,
und wie geschieht, was schon geschah, getan wird,
was schon getan ist: säen, pflanzen, ernten!
Paläste bauen und zerstören! Länder
bevölkern und zur Wüste machen! . . . Schätze finden, sie
verlieren und suchen, wiederfinden dann!"

He feels that he stands in the shadow of approaching death, but he still craves an aspect of life that he has never known, a something subtle and beautiful that he cannot define. He is, in reality, struggling with the same problem that perplexed Julian. But he does not set about solving it through abstract speculation. In the person of the Saxon "Geisel," Gersuind, he finds himself confronted with the living, palpitating soul of paganism itself. The drama at once resolves itself into the clash of these two personalities and to a certain extent into a struggle between Christianity, as represented by Karl, and paganism, as represented by Gersuind.

The technique of Hauptmann's presentation of Gersuind is very interesting. He gives us no less than seven distinct and different conceptions of her character. We see her as reflected in the minds of her uncle, of Rorico, of Ercambald, of Karl, of the Oberin, of Alcuin and of the people, and yet remain not a little puzzled as to what the real Gersuind really is.

At Gersuind's first appearance we see, and are influenced by, her uncle's conception of her. He is indignant at her confinement in the cloister and calls her a captive bird, pining in a narrow cage and longing to return to its old free life. To him she is the innocent victim of an unjust fate.

In sharp contrast to this is the conception held by Ercambald, Karl's chancellor and chief church official. In his eyes she is of the very essence of the stubborn and heathen Saxon folk, who persist in returning to their ancestral deities "wo nicht Stock und Rute und Faust dawider ganze Arbeit tun."

Ercambald himself is the very embodiment of the conventionalizing, desiccating influence of the phase of Christianity he promulgates. Gersuind's fate is to him a mere passing incident; with Karl's decision to return her to the convent school the incident

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is closed. He is, however, not wholly insensible to her strange power:

> ". . . hier heisst's, behänget Euch mit Spiegeln,
> so stirbt der Basilisk am eigenen Blick.
> . . . Seht sie an!
> seht sie nicht an; noch besser! denn es ist
> in ihrem Auge was, das Spiegel trübt!"

But it creates in him only uneasiness. He puts on her and all that is inexplicable about the all-comprehensive label "heathen," and turns to the truly important affairs of life, such as the reception of ambassadors and the inspection of the apple harvest.

Ercambald has grown old in the Kaiser's service, but now Karl revolts from him utterly and persistently refuses to endure his presence. Rorico attributes this to Karl's resentment of Ercambald's treatment of Gersuind. But while this is certainly one of the many signs of Gersuind's influence over Karl, he is too big a man to be long moved by petty resentment. His attitude toward Ercambald is actuated by something deeper and more subtle. He revolts from the whole philosophy of life that Ercambald represents, because it suddenly appeals to him as unbearably didactic and self-complacent. With Julian he is ready to challenge the type of Christianity among courtiers "die ihre Hände über dem satten Bauch falten und piepsen ob Gottes Sohn wirklich aus nichts erschaffen ist."

The first act is crammed with indications of Gersuind's influence over Karl. His whole attitude, the strange restlessness which perplexes his courtiers, is her work, it is manifest, and dates from his meeting with her in the cloister school. Gersuind's radiant beauty and the touch of something uncanny and inexplicable about her, her "unkindlich-Wissen und Verstand," make her a personality that claims the attention of every one. But Karl alone feels and responds to the challenge which she, simply by being what she is, breathes out against the whole organization of society, the structure of church and state which Karl has championed and brought to a perfection never before seen. This gains the stronger hold on him because it remains a feeling and never gets upon the basis of definite and articulated thought. He does

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not know the secret of her influence over him, though he busies himself with setting up hypothesis after hypothesis to account for her.

His first conception of her is largely idealized. "Rein wie der Mond, das Antlitz einer Heiligen"; and again,

> "Dies blonde Gras auf Kinderköpfen . . . wie,
> sind diese Fäden feinsten Goldes, dies
> Gespinnst der Unschuld . . . ist es nicht ein Wunder?"

Gersuind's attitude when he speaks with her alone does not fit this hypothesis, as Karl at once feels. She startles him by her entire lack of regard for her uncle, but most of all by her conception of him and his reason for wishing to speak with her quite alone—"Ich kann auch schweigen, König Karl." He is even more puzzled by her ideals of life, so utterly opposed to all the traditions and conventions of the world he knows. She desires only to go her own way, answerable for her actions to no one, free to do whatever she enjoys doing at the moment. Karl cannot fathom her but he sets her free to work out her fate according to her own notions of life.

Left alone with Rorico, Gersuind at once exemplifies her attitude toward life. Rorico's youth and attractiveness appeal to her own youth, to the instincts of her nature. Untrammeled by conventional standards or moral scruple she makes an instant and direct appeal, "Schöner, nimm mich mit!"

Rorico is young, human and no model of virtue, but he recoils from this, not because his standards of right doing are outraged but because her "being is strange and through strangeness terrible." He cannot comprehend her, therefore she repels and terrifies him. His attitude and his words to her give his interpretation of her very definitely.

> "Ja, wie ein gelbes Schlänglein in der Gabel,
> So! ja! im Spalt von einem Haselzweig:
> dass es nicht züngeln kann und mich nicht stechen!
> Komm Racker, Dämon! aus des Kaisers Haus! (Er hält sie mit zwei Fingern am Saum ihres Kleides im Nacken von sich ab und schiebt sie vor sich her hinaus.)"

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Gersuind, present and face to face with Karl, is a puzzle; absent she becomes a torment. In the solitude of his country estate he is haunted by the thought of her; she becomes again "die Heilige" to him. The revelation of her infatuation for Rorico and her persistent pursuit of him is a shock to Karl but his anger is directed against Rorico, not Gersuind. As the two face each other again there is repeated the clash, not only of two powerful personalities but of two absolutely different conceptions of life. Gersuind has been living the life of her own choice and has no complaint to offer, but Karl reproaches himself for having cast her out defenceless into a sinful world.

> "Ich tat dir Unrecht! denn ich war's, es war
> die Laune des Gebietenden, die dich
> hinunter stiess in jenen Abgrund, den
> ich kannte: unrein, wimmelnd von Geschmeiss.
> Ich war's und reiche heut' dir meine Rechte,
> um aus dem tiefen Elend, das du nun
> ermessen hast, dich an das Licht zu zieh'n.
> Verstehst du das?
> GERSUIND (lachend). Bei Irmins Golde, nein!"

By the standards of her own tribe Gersuind is an outcast, as Karl points out to her, but she refuses to accept these or any other standards. Under this pressure Karl is forced to abandon his conception of her as "die Heilige."

> ". . . Ich sehe freilich nun,
> dass du gedankenlos und blind nicht handelst,
> vielmehr mit Vorsatz, Kühnheit und Entschluss,
> das Böse suchst . . .
> Doch wenn ich dich betrachte, fass ich's nicht!"

On the very face of it Gersuind is manifestly an enigma to Karl; but while it is not quite so self-evident, Karl is just as truly an enigma to Gersuind. That she retains her first and false conception of him she shows by suddenly flinging her arms around his neck with an appeal to the primitive, brute man in him—"Sei doch nicht närrisch, Alter!"

Here is the real turning point of the action, and Karl does not conquer without a fierce struggle:

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"Geh! habe Mitleid! denn Vernunft erstickt
und jede Macht der Majestät vor dir
und in dem Lächeln deines dünnen Mundes!"

In all of *Kaiser und Galiläer* Ibsen did not once bring into such dramatic and telling conflict the essence of Christian ideals, which is self-denial and self-control, and the essence of paganism, which acknowledges neither, but gives free rein to individual impulse and desire.

Karl conquers in that he does not yield, does not consent to give up his own standards of living. But he is very far from conquering in his attempt to impose the same standards upon Gersuind. He sets up a new hypothesis to account for her:

"Noch blinzelt deine Seele, halb erwacht
erst, und du tappst im Zwielicht."

His new plan for her reveals the fineness and magnanimity of his nature:

"Hier dieser Edelsitz ist dein, Gersuind!
In diesem Garten sollst du wurzeln, du
Entwurzelte! . . . Fröhlich magst du sein
im Schutze deiner Mauern, unbetrübt!"

In reality, however, it imposes Christian ideals hateful to Gersuind, who does not wish protection and shelter but freedom from all restraint. She accepts the plan perforce but she is very far from accepting the ideals. She does not remain wholly unresponsive, however, to Karl's largeness of nature, as she reveals by kissing his hand.

For Karl the situation is complicated by a dozen conflicting elements. Gersuind's glowing youth makes him feel and resent his own age. For the first time in years his mind has turned from the affairs of state to the concerns of his own personal happiness and he feels half-defiant, half-guilty. The forces of tradition are strong in him and Gersuind outrages them at every turn. The greatest complication of all is his growing love for her. He will not cast her out for refusing to accept his standards, yet he cannot lay them down for hers.

This harassed state of mind prompts him to send for Alcuin,

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partly for the sake of sympathy, partly to see what he makes of Gersuind. Alcuin represents a type of *Weisheitslehrer* some four centuries later than the era of *Kaiser und Galiläer*. He stands for scholasticism at its best, and in simplicity and sincerity of character is far superior to the type of *Weisheitslehrer* represented by Libanios. His attitude toward Gersuind is, however, frankly heathen. If her youth and charm can bring rejuvenation to "this earthly Zeus," as he calls Karl, why not? Yet he sees in her much that Karl does. Her words, all that she is and does, set him to pondering.

The wild revel at the tavern is proof of Gersuind's continued refusal to accept Christian standards. This comes partly as a reaction from long confinement, partly because Karl's unresponsiveness has wrought her to a frenzy.

The natural man in Karl blazes out when he hears this. It is not merely jealousy. He realizes that she has put him in the light of a dupe and a laughing-stock before the people, and feels that his kingly honor demands her death. This threat awakens in Gersuind the blind and passionate craving for life that is wholly primitive. She sinks to her lowest in a wild appeal:

> "Lass mich leben! lass mich leben!
> schliess mich in schwere Ketten, König Karl:
> und keiner soll mich sehn als du! und niemand
> als du, soll mich fortan berühren! niemand
> die Ketten, süsser Vater, um mich tun,
> als du! auch lösen, starker Cherub, niemand
> als du! nur du! du Gott des Himmels! du!"

She rallies from this and returns to her natural pride and defiance in the next appeal, which arouses Karl's sense of justice and prompts him to set her free:

> "Was hebst du Wegwurf auf? was liessest du
> mich Wegwurf denn nicht liegen, wo ich lag,
> und hobst mich auf? du tatest's ungebeten!
> Ich klagte nicht! ich schrie nicht, rief dich nicht!
> Ich warf mich nicht vor deine Füsse hin
> und bettelte: nimm, heb' mich aus dem Staube!
> du aber packtest mich und hieltest mich:
> Warum? wozu? der du doch mein nicht achtest,
> nur meiner spottest, meiner nie begehrst!"

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And yet she is loath to leave this garden which she claims has been so cold and hateful to her, and she catches up and carries off the ring which Karl has thrown away.

The first half of the concluding act is largely given up to emphasizing this change in Gersuind's attitude toward the Kaiser. She is dying of poison administered by Ercambald the night of the revel at the tavern. She, to whom all wine is hateful, drank the draught because she fancied it to be Karl who offered it:

> "Er hatte langes Haar: wie Kaiser Karls
> so weiss, und deshalb trank ich sein Gemische."

She cherishes the ring still. Her infatuation for Rorico is gone:

> . . . "Er
> ist schön! doch nicht, wie Karl! bei weitem: nein!
> Karl ist ein Gott! wir andern sind nur Menschen!"

The final proof is given by the Oberin, who tells the king that Gersuind died with his name upon her lips.

There can be no question, it seems to me, that Gersuind is brought to realize the greatness of Karl's character. This softening cannot be due merely to physical weakness, for she exhibits all of her old perversity toward the sister who waits on her so faithfully. It would perhaps be too much to say that she accepts Karl's point of view, or his philosophy of life, but she is overcome by his personality.

But though Karl is the victor in the conflict of personalities, he does not come off scatheless. He is tormented by remorse for having cast her off. But this is not all. According to all the traditions of his faith and training, she must be, as he says, "eine Flocke Höllenglut," and yet his bigness of soul revolts at this and refuses to accept it. In whatever light he regards her, she upsets his fixed ideas of life, and retains her influence over him as something mysterious, tantalizing with the hint of a vision caught for an instant but not comprehended. There is something very noble and pathetic in his last words about Gersuind:

> "Recht so: hebt sie empor! tragt sie hinweg!
> Ich muss noch immer lernen! Muss von ihr

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auch das noch lernen, was sie mir verschwieg!
Sagt niemand, dass ich noch von Kindern lerne,
hört Ihr? sagt ihnen: unser König Karl
weiss nicht, was Irrtum ist! sagt ihnen, er
sei hart wie Diamant und weine niemals.
Seht Ihr den Mann, der jener Toten nachfolgt?
die Menge weiss von diesem Manne nichts!
lasst ihn—verratet nichts!—lasst ihn nur gehen!
Was er nicht kannte, wird dem Volke nun
nicht fehlen: und ein Greis bleibt ihm zurück."

Kaiser Karl is, in my opinion, the finest man that Hauptmann has ever given us. Yet I feel that the title was rightly chosen, and that the drama was really written for the sake of Gersuind. In her Hauptmann has presented a perfectly natural and unartificial personality. Viewed in this light all that is perplexing and contradictory about her character becomes perfectly explicable. She is utterly free from the whole body of moral principles, conventions and traditions built by society through thousands of years of evolution. As she truly says of herself:

"Ich bin ein Kind von eurer Eva nicht
und eurem Adam: meine Ureltern
assen von eurem Sündenapfel nicht!
drum weiss ich also nicht, was gut und böse."

In spite of her Saxon parentage she is no no way representative of the tribal standards. She is not a Saxon; she is the spirit of paganism.

I do not think that Hauptmann presented her as an ideal to show by contrast the degradations brought about by civilization. Yet when she is placed in the midst of a relatively complex and artificial society, she does make certain things stand out very sharply. Ercambald, who wrought her death, shrinks into insignificance beside her. She utterly silences scholasticism, even as represented by so noble a type as Alcuin. But Rorico and the Oberin seem larger and finer at the end than at the beginning. Karl gains immeasurably by the contrast. Whatever is false or artificial cannot stand the test of her presence, but simplicity and sincerity shine the brighter for it.

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SHAKESPEARE AND HIS LONDON ASSOCIATES AS REVEALED IN RECENTLY DISCOVERED DOCUMENTS.

BY CHARLES WILLIAM WALLACE

Most of the fifty-six records published in the following pages belong to the Court of Requests of the reign of James I, the extensive proceedings of which had lain unexplored until they were prepared for examination at my request. As a result of careful search by myself and my wife, I am this year publishing the rest of the important theatrical evidences that these proceedings hold.

Not every record in such a series, mainly in suits at law or equity, is, when taken alone, of high importance. There is no advantage, however, in complaining that a single human act does not resurrect Shakespeare in the flesh, or that a grain of sand does not rehabilitate the old theatres. It is through the aggregated whole that each part is enabled to contribute its proper use and worth, though singly it reveals no potentiality. Slight as some of these records are, and mutilated as some of them have come to us, there is not one, now that we have them, that the historian in his devotion to the true and abjuration of the fanciful would dispense with.

The court-pleadings, subsidy rolls, parish registers, and transcripts of wills are written on parchment, the rest, on paper.

Fifty-two of the records here presented are written in the

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modified Gothic hand used by most men of Shakespeare's time, while four, from the French, are in slightly gothicized Roman. This is a fair proportion of Gothic and Roman writing among the contemporary records of English archives. Although a score or more of different scribes are represented, there is greater uniformity in the characters used than in handwritings of today, and the script is generally easier to read than that of many of the letters that come to me from all parts of the world. The native English hand of Shakespeare's time, a modified inheritance from the ancestral Anglo-Saxon, was essentially Gothic. That hand rather than the invading and little used Roman was taught in all the schools. Scholars and their university protegés mainly constituted the small number of men who wrote the Roman. Those who understand the practices and requirements in schools, universities, and business life of Germany of today with reference to these two scripts have a fair basis for judging earlier English conditions.

In presenting these records, I have chosen to introduce each of the three sets with a very brief notion of their nature. But the items of fact must be gleaned from the documents themselves. Brief explanatory head-notes in brackets accompany many of the documents.

As there is no uniformity of spelling in the originals, so there is none in the present print. No more is there a uniformity in the use of signs of contraction in the originals, and the consequent dissimilar expansions here. The printing of all signs would have required special type. Instead, therefore, italics are used to show the expansion of a shortened form. Latin words are generally spelled out in full, even when no sign was used. But in the body of a document, when a contracted form is retained, it means that the original was written without sign. Short "s" has been substituted, as usual, for long "ſ". While these devices of typography are far from ideal, this explanation will make their uses clear. It is hoped that the reader may find that the aim throughout to represent the original faithfully has been attained.

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I

THE BELOTT-MOUNTJOY CASE.

The thirty-nine records assembled chronologically here, three from the Parish Registers of the St. Olave, Silver street, twenty-nine from the Public Record Office, five from the archives of the French Protestant Church, Soho Square, London, and two from Somerset House, combine to make a contribution to Shakespearean biography of unusual interest and of considerable importance. The first report of these documents, published in *Harper's Magazine,* March, 1910, has been discussed not only by scholars and literary periodicals but by the public press.

There are two chief reasons for this unusual appeal to scholar and layman. First, the matter is sensational in its nature, and would appear so even if it related to the most prosaic folk of our own time and were reported in the daily press. But that sensational quality is multiplied a hundred fold by being associated with the greatest poet of all times and climes, in whom all people are more or less interested. Second, an increased yet withal sober desire for new knowledge about the man we all love makes the world hail new information at this late day with enthusiasm. I could wish this latter were the prime reason for the extraordinary interest. But that was not to be hoped for at the outset. Indeed, the sensational nature of the whole story made me hesitate, as some of my scholastic friends on both sides of the water will recall from our conversations and correspondence, to present it to the public in popular form, lest too much attention should be drawn to the catchy and minor rather than to the essential and contributive items of human interest and biographical information.

On the other hand, this very undesirable sensationalism has been of advantage in a measure, by serving as a raft on which to float the new information to universal ports. Men and women thereby have been inspired with enthusiasm to learn more about Shakespeare than they knew before, and to read more of his plays or to reread familiar ones more keenly than before, while students of his biography have been brought to look with closer

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inquiry into the truth or falsity of what has hitherto been written down as a heritage of placid acceptance. Therein good and desirable ends are served, which, men will agree, more than counterbalance the evil of sensationalism that clings about the documents and the story they tell in any form.

It remains now for the new information to complete its legitimate work in the world, by appeal to the sober judgment. To this end, the documentary evidence itself is the first essential, and a cool, analytic, judicial brain the second. Whether every reader may justify this latter requisite as a compliment to himself or not, remains with him and the rest of the world to settle. That the reader may have free and independent range, the records are printed here *in extenso,* barren of all interpretative comment. It is impracticable to present also the thousands of contemporary records, or even extracts from them, bearing upon the life of the times, and illuminating much in these thirty-nine thus isolated from their surroundings. While I admit some advantage over the general reader in this regard, still there is quite enough here and in available print to enable the scholar to make an honest judgment of the materials, and that is all sufficient for all men of all times. Later, with more leisure at my disposal than I can now command, I hope to join him in that same sort of effort, and to derive benefit from his labors as he may from such of mine as here appear.

In deciding what documents to present in the case, it seemed best, since not all could be given, to confine the list to those of direct bearing. The records from the Lay Subsidy Rolls and the Parish Registers show Mountjoy, with whom Shakespeare lived, a resident of St Olave, Silver street, from some time in 1599. The suggestion of still earlier residence there, since the subsidies were allowed in 39 Elizabeth (1597), is borne out by analysis of the other records. The whole long series of twenty-six documents in the Court of Requests and the five others from the Consistory of the French Protestant Church of London, arising directly out of the marriage between Stephen Belott and Mary Mountjoy, arranged between them by William Shakespeare at

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request of Mary's mother, belong inseparably in the series. Even the last of these in the Consistory, showing Mountjoy's insubordination to the Church and his moral obliquity since the death of his wife, thus explaining the foundation for Belott's charges against him in the Court of Requests in the matter of his recent reckless living, are necessary, for a case was rarely referred from a civil to an ecclesiastical tribunal except on moral grounds. That both Mountjoy and Belott were French is shown in Mountjoy's patent of denization and Belott's will, as well as in the Lay Subsidy assessments and the testimony of Humphrey Fludd. That they were Huguenots appears from the Consistory records and the will.

To these essential documents might have been added others of a more or less side-illuminative nature, such as records relating to Daniel Nicholas, son of Sir Ambrose Nicholas, a former Lord Mayor of London, others concerning Humphrey Fludd, the King's trumpeter, who as a member of the royal household was often employed to carry letters to and from Paris and other places on official business, and so on. Such of these as throw light on the character and standing of Shakespeare's neighbors and associates in this case I may assemble for the final treatment. The rest may be passed with a reference.

The value of these documents lies chiefly on the side of human interest rather than of contributive knowledge. Partly because of this and partly because of the very appreciative but unsigned editorial note set at the head of my article in *Harper's Magazine* for March, 1910, I have been credited with a judgment of the contributive value of these documents which in the course of my article I take special care to show they do not possess. My entire article, from the title to the last word, puts forward sharply and unequivocally the features of human interest. In this regard, it is true that no other document or series of documents in Shakespearean annals equals these. But human interest is a very different matter from contributive knowledge, which the general public has taken to be one and the same thing. In the article I took care to differentiate these two qualities and pointed out that

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the present documents do not have the contributive worth possessed by the Osteler-Hemynges records, as will more fully appear in the final analysis of them.

Without further comment, the records in the Belott-Mountjoy case are here presented *in extenso*.

[1]

Lay Subsidy Rolls, 31 October, 41 Elizabeth, Box 146, Roll 390.

[Mountjoy's Assessment, 1599.

Under "St Alphege and Sainte Olaues Parishes" are taxed for this year only two "Strangers," that is, foreigners, one of whom is assessed as follows.]

Christofer Monioye ———— v^{li} ———— xxvj^{s} viij^{d}

[The first amount of 5*l.* is the property value, upon which the second amount, 26*s.* 8*d.*, was paid as a tax. Citizens were taxed 4*s.* in the pound on lands, and 2*s.* 8*d.* on goods, while aliens were taxed double on both. The above tax of 26*s.* 8*d.* shows that Mountjoy was assessed on goods only, at the usual double rates levied on foreigners.]

[2]

Lay Subsidy Rolls, 1 October, 42 Elizabeth, Box 146, Roll 409.

[Mountjoy's Assessment, 1600.

On October 1, 42 Elizabeth, the assessment of the 3^{d} subsidy granted in 39 Elizabeth shows that the adjoining parishes of St. Alphage and St Olave had but one "Straunger," who is recorded under that heading with the same tax as in 1599 thus:]

Xpofer Monioye ———— v^{li} ———— xxvj^{s} viij^{d}

[The two notices above are the only records of Mountjoy in the Subsidy Rolls, which I have personally searched. Later, I find the Huguenot Society, in its three great volumes of *Aliens in London*, likewise finds him but these two times.]

[3–5]

Parish Registers, St Olave, Silver street, London.

[Mountjoy.—Burial and Marriage Records.]

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Burials

[3]

1600–[1]

Joseph Tatton, *ser*vante to Christopher Montioye. . .January 14.

[4]

1606

Mary, wife of Christofer Montjoy . . . October 30.

Mariages

[5]

1604

Stephen Plott, and Mary Montjoye . . . Nouember 19.

[6]

Patent Rolls, 5 James I, Part 30.

[Denization of Mountjoy, 27 May, 1607.

It was the Sovereign's practice to grant to some lord or knight patents of denization, by which such patentee could go to foreigners of the realm and get from them all the fees possible for making them denizens. In this case, a patent had been granted to John Levingston, Esq., by which fifteen foreigners, on the 27th of May, 1607, as recorded in the last patent of this roll, were made denizens. The fees, being a private perquisite, are of course not stated. Preceding the list of those denizenized here under Levison's patent are two other short lists on the patents to two other farmers of such privileges.

The form of denization is in Latin, and is written out in full for the first alien only. For the others, "consimiliter" is used. But to each person denizenized the full form was sent. The pertinent part here reads as below.]

Jsti qui sequnt^{ur} concedunt^{ur} p*er dom*inum Cancellar*ium* Angl*iae* virtute warran*ti* Regis Joh*anni* Levington Armig*e*ro fact*i*./

[Here follows the list of fifteen, sixth of which reads]

Cons*imiliter* Christofero Monioy in villa de Cressey sub obediencia Regis ffranco*rum* oriundo T*este* R*ege* apud Westm*onasterium* die & Anno [i. e., 27 May, 5 James I] supr*a*scripto./

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[7–32]

BELOTT VS. MOUNTJOY.

Court of Requests, James I, Uncalendared. Case of Stephen Belott vs. Christopher Mountjoy.

[Four skins, comprising Bill, Answer, Replication, and Rejoinder, thonged together as usual at upper left corner; three sets of paper depositions thonged to their three respective skins of interrogatories, comprising fifteen documents, one of which is Shakespeare's deposition. These nineteen documents, since my report of the case to the Master of the Rolls and publication in *Harper's Magazine* for March, 1910, have been withdrawn from circulation and are now preserved under glass in the Historical Museum Room of the Public Record Office. Seven other records are in the Miscellaneous Books of the Court of Requests. Besides these twenty-six documents preserved in the Public Record Office, bearing directly on the case, three others, touching Mountjoy, are also there. Other information is furnished by the Parish Registers of St. Olave, Silver street, concerning the family and marriage as presented above, and by the consistorial records of the French Protestant Church, Soho square, London, containing notices of the action taken by the Church in accordance with the Court's final order referring the case there for settlement, and by Belott's Will at Somerset House.

It is remarkable that every court-record in the entire case is preserved, as published below. The set of depositions in which Shakespeare's testimony occurs is slightly rotted along the right edge. All the rest are splendidly preserved.]

[7]

BILL.

[*In dorso*] xxviij° die Januarij Anno *Regni Regis* Jacobj Angliae &c Nono et Scotiae xlv°

per war*rantum*

To the King*es* moste Excellent Ma^{ty}

In all humblenes Complayninge sheweth vnto yor moste excellent Ma:^{tie} yor highnes poore and faythfull and obedient subpliant Stephen Belott of London Tyermaker, That whereas yor Suppliant aboute nyne yeares sithence laste paste beinge then a

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Servant vnto one Christopher Mountioye of London Tyer maker [did] well Carry and behaue himselfe in the tyme of his saide service wth the saide Christopher bothe iustly & to the greate p*roffitt* and advantage of the [said] Christopher, as that thereby yor saide Suppliant in all outwarde appearance did obtayne the good will and affec*ion* of him the saide Christopher in suche sorte as hee then offered vnto yor saide Suppliant, that yf hee would accept in marriage one Marie Mountioye beinge his daughter and only Child that then hee would giue in Marriage wth his saide daughter vnto yor saide Suppliant the somme of three scoore poundes or thereabout*es* for a porc*ion* vppon yor saide Suppliant*es* daye of Marriage or shortlie after and would likewise at the tyme of his deceasse leaue vnto yor said Suppliant and his saide daughter the somme of two hundred pounds more vppon wch offers of ye saide Compt.^lt^ and vppon his p*er*swac*ions* yor said Supp.^lt^ did shortly after entermarry wth the saide Mary and haue liued togeather by the space of theis five yeares and haue had diuers Children betwixt them to the greate encrease of theire Chardge and are likelie to haue manie more so that theire poore trade is not able to giue them maintenance and yor saide Suppliant lent the saide Christopher the somme of fortie shillinges wch hee denies to paye or to p*er*forme his former promise, But so it is may it please yor moste excellent Matie. that yor said Suppliant growinge since his saide entermarriage wth the saide Mary into some want and necessitie by the reason of the encrease of his Chardge as a fore saide yor saide Supp.^lt^ therefore repaired ynto him the saide Christopher desiringe him to satisfy and paye vnto yor saide Supp.^lt^ the said somme of three scoore poundes soe promised by him vnto yor saide Supp.^lt^ as all so to putt in suertyes to leaue yor Supp.^lt^ and his wiffe tow hundred poundes att his deathe, who all together forgettinge his ffatherlie promisses nor pityinge the distressed poore estate of yor said poore Subiecte and his greate Chardge verie vnnaturally dothe not only nowe deny his said p*ro*misse and refuse to paye the said somme of three scoore poundes but likewise denieth the payment of the saide somme of ffortie shillinges so lent him as a fore said. As allso hath sithence

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giuen forthe diuers tymes to diuers persons, that hee intendeth not to leaue vnto yor Supp.^lt^ his wiffe nor Children the vallue of one penny when soever hee shall departe this naturall lyffe, beinge not onlie to the greate [hurt] and hinderance of yor said Supp.^lt^ his wiffe & famyly but alsoe to theire vtter vndoeinge yf they bee not releiued by the iustice of this honorable Courte, & beinge a man of good estat & w^th^out charge. In Tender Consideracion whereof and for asmuche as by ye strict Course of the Common lawes of this Realme yor said pore subiecte is remediles either to recover the said three scoore poundes soe promissed as aforesaid or to Compell him the saide Cristopher Mountioye to putt in suretyes to leaue tow hundred poundes to yor highnes poore subiect & his wiffe at his death beinge of late inclyned to waste his estate for that yor said subiect cannott prove the saide promisses in soe strict manner as by the Common lawe is required or yf hee Could yet hath not yor said subiect by the said Common lawes of this Realme ffitt or apt remedy neither is yor saide loyall subiect able to proove the loane of the said fforty shillinges to ye said Christopher Mountioye but perswadeth himselfe that the said Christopher either to dischardge a good Conscience as knowinge periurye is a moste damnable sinn or to avoide the punishment inflicted on such as Count the saide sinn, may it therefore please yor highnes the premisses Considered, To graunt vnto yor subiect yor highnes moste gracious writt of privie seale to be directed vnto the said Christopher Mountioy Commaundinge him thereby at a Certayne day and vnder a Certayne payne therein to be directed personally to appeare before yor highnes in yor highnes Courte of White Hall Comonlie called the Court of Requestes Then & there to make a direct answer to the premisses and to stande to suche further order & direction therein as by yor highnes or yor said Counsell shalbe thought meete to stand wth equity & good conscience, And yor said loyall subiecte accordinge to his bounden dutye shall hartely pray to god to prolonge yor highness happy Raigne and lyfe longe to Contynewe./

Raf: Wormlaighton.

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[8]

ANSWER.

Tertio die februarij A° *Regni Regis* Jacobi Angl*iae* &c nono, et Scotiae xlv°./

The Answeare of Christopher Mountioy to the Bill of Complainte of Stephen Belott Compl[t]

This defendante All advantages of exception to the Insufficiencie and Incertainty of the sayd Bill nowe and at all times saved vnto him for answeare thervnto and for the manifest declaration of the truth saith That about ten yeares last past the defendante was Contentented [*sic*] at the Entreaty of the sayd Complainauntes friend*es* to accept of the Complainaunte to serve him as a prentise to learne his trade being a Tyremaker his said frend*es* p*ro*missinge to finde him Convenient apparrell while he shoulde so Continue in this deffendaunt*es* service. and the said Complainaunte did serve this defendaunte as a Prentice to learne his trade the space of six yeares or thereabout*es* But dueringe all the time of his sayd service neither the Complaynaunte nor any of his friend*es* did according to theire p*ro*mise fynde him any apparrell att all savinge Linen but this Defendaunte was enforced to finde him all the Residue of his apparrell duering all the sayd time neither had the Complainaunte duering all the sayd time of six yeares any further or other releefe or oth[r] maintenaunce from any of his friend*es* but was duering all the saide time wholy and solye mayntayned by this Defendaunte And after the said Complainaunt had served this Defendaunte as aforesayd the said time of six yeares then the said Complainaunte was desierus to travell into spaine and this Defendaunte did furnish him wth mony and other necessaryes for the Iorney to the vallue of six pound*es* or theraboute*s* after which time the sayd Complaynaunte returned from his travell vnto this Defendaunte againe and was a suter vnto this Defendaunt*es* daughter to marry her and to that purpose did move this Defendaunte and his then wife for theire Concent*es* for the marriage which this Defendaunte and his sayd wyfe being poore and able to bestowe lyttle or nothinge wth their

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sayd Daughter in marryage (save y^t^ this Defendante had then brought her to a good perfection in his sayd trade of Tyermakeinge) was Contented to yeelde vnto: though the said Complainaunte neither then had nor ever sithence to the knowledge of this Defendaunte any mony, or other valluable goodes or landes whatsoever from his sayd friendes nor any other thinge whatsoever but what he had gotten in this Defendauntes service and by the trade that this Defendaunte had learned him And afterwardes vid. about five yeares past the sayd Complainaunte was marryed to the sayd Daughter of this Defendaunte at which mariyage it was agreed betweene the said Complainaunte and this Defendaunte that if the sayd Complainaunte with his wife shoulde Continue and worcke in theire trade to the benefitt of this Defendaunte in the house of this Defendaunte duering the space of twoe yeares or thereaboutes after the said Marriage this Defendaunte giveinge them Conveniente housrome and dayate Convenient for them so that this Defendaunte might only haue the benifitt of theire laboures Then this Defendaunte at the end of the sayd twoe yeares would give vnto the sayd Complainaunte fiftie poundes or to that effect as this Defend^t^ nowe remembreth aft^r^ which time the sayd Complaynaunte did for a little time remayne in the house of this Defendaunte accordingly But after the sayd Complaynaunte and his wife had stayed in the house of this Defendaunte as aforesayd the space of halfe a yeare or there aboutes he refused to stay there any longer and would needes take oth^r^ Courses for his better prefermente as he then pretended And at the end of the sayd halfe yeare when the said Compl^t^ Did departt from the house of this Defendaunte out of his love to the sayd Complainaunte and his wife (beinge no other way Compellable thervnto) did bestowe on them a good proportion of houshoulde stuffe and the thinges Concerninge theire trade according to this Defendauntes poore ability being to the vallue of Twenty poundes or theraboutes and lykewyse ten poundes of ready mony to put into theire pursse and did hartely desier theire welfare and lykwise did Intende to leave vnto the sayd Complaynaunte and his wife beinge the only chylde of this Defend-

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aunte all or the moste parte of that estate which god should have blessed them with at the time of his Death And allso in his fatherly love to have ben helpfull to them from time to time accordinge to his poore abillity After which time (y^t^ the said Complainaunt was gon from the house of this Defendaunt) about a yeare This Defendauntes wife dyed and then the said Complaynaunte and his wife Came againe and lived wth this Deffendaunte as partneres in ther sayd trade of Tyeringe about the space of half a yeare duering which time this Defendaunte had in his handes the summe of forty shillinges of the Complaynauntes mony and at the end of the said Halfe yeare & about the time of the Complaynauntes depareture from this def^tes^ house the sayd Complaynaunte being Indebted vnto a Bruer the summe of three poundes desiered this Defendaunt to pay it for him to the sayd Bruer which sayd somm of three poundes this Defendaunte payed for the sayd Complaynaunte accordingly but this def^t^ was nev^r^ sithenes repaide the said 3^li^. or any parte therof other then the said 40^s^ as aforsaid. and dueringe the sayd half yeare that the Complaynaunt was with this Defendaunte as aforesayd this Defendaunte did buy into the shopp with his owne mony silvered wyer and oth^r^ Comodyties Concerninge theire trade to the vallue of Ten poundes or theraboutes for which the sayd Complainaunte should by agreemente have payd halfe but did pay never a peny And this Defendaunte absolutely denyeth that he did ever to his knowledge offer vnto the sayd Complaynaunte in marryage wth his daughter the summe of Threescore poundes or any portion or other somme whatsoever other than the sayd summe of ffifty poundes at the end of the foresayd three yeares and vpon the Considderation as before is expressed And this Defendante lykewyse denyeth that he did ever promise to leave to the sayd Complainaunte and his wife at his Death the some of two hundred poundes or any other Certaine summe but as aforesayd did Intende to deale with the Complaynaunt and his wife at the time of his Death as it is fittinge for a father to deale with his only Chylde But this Defendaunte neither then Coulde nor yet Canne set dowe any Certaynty thereof for that this def^t^. both then was and yet is

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a poore man and knows not howe it will please god to blesse him in his estate at the time of his Death nor how the sayd Complaynaunte and his wife will behave themselues towardes this Defendaunte In his life time wherby they may deserve this Defendauntes either more or lesse affection and love towardes them. And this defendaunt lykewyse denyeth that he to his knowledge doth owe the Complaynaunte forty shillinges or any other former somme of Mony whatsoever otherwyse than as before is expressed An this Defendaunte further saith that he did about a month sythence earnestly request the sayd Complaynaunte in the presence of his neighboures to account wth him for the sayd Reckoninge betweene them at which time the sayd Complaynaunte did give this Defendaunte Ill Languages and bid him Come by his mony howe he Coulde Without that that any other matter or thing Contained in the sayd Bill of Complaynt materiall or effectuall to be answered vnto and not heerin sufficiently Confessed and avoyded denyed or traversed is true All which matters this Defendante is ready to averr and prove as this most honorable Court shall award and humbly prayeth to be dismissed out of the same with his reasonable Chardges in this behalfe most wrongfully sustayned/

Geo: Hartoppe

[9]

REPLICATION.

Quinto die Maij Anno *Regni Regis* Jacobi Angliae &c x° et Scotiae xlv°/.

The Replicacion of Stephen Belot Comp^{lt} to the Answer of Christopher Mountioye def^{t}.

The said Comp^{lt} not Confessinge or acknowledginge anie matter or thinge materiall or effectuall in the said def^{tes} Answer conteyned to be true in suche sorte manner or forme as in and by the said bill they are sett forthe and declared sayth that the said Answer is in all or the moste parte thereof vntrue incerteyne and insufficient to be replyed vnto for manie imperfeccions in the

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same appearinge All the advantages of excepcion to thincertaintyes and insufficiencies whereof nowe and at all tymes hereafter to this Comp^lt^. saued, This Comp^lt^. for Replicacion sayeth in all thinges as in his said Bill of Complainte he hathe sayed, and doth and will auer maynteyne iustyfie and proue his said Bill of Comp^lt^. and euerie matter article and allegacion therein Conteyned to bee true Certayne and sufficient to be answered vnto set forthe and declared w^thout that that this Comp^ltes^ ffrends at the tyme of his Commynge to bee Apprentice wth the said def^t^ did *pro*mise to finde this Comp^lt^. Convenient apparrell while he shoulde Contynewe in the said def^tes^ service Or that the said def^t^ at the tyme of this Comp^ltes^ trauaile into spayne did furnishe this Comp^lt^. wth six poundes or wth any other somme of Money but that this Comp^lt^. was only therein furnished by himselfe w^thout^ that that allsoe this Comp^lt^. moved the said def^t^ or his wyffe for theire Consent*es* to the Mariage of the said Mary but that this Comp^lt^. was only drawen therevnto by the said def^t^, And w^thout^ that that after the Marriage of this Comp^lt^. wth the said Mary there was any suche Conclucion or agreement made betwixt the said def^t^ and this Comp^lt^. euer receiued any good*es* or howsehold stuffe of the said def^t^ or any things Concerninge theire trade, or desiered the said def^t^ to pay the somme of three poundes or any other somme to the Brewer, or was soe indebted vnto the said Brewer as by the said Answere all soe is alleadged, wth that that the said def^t^ did *pro*mise vnto this Comp^lt^. the somme of threscore pounds in mariadge wth the said Mary his daughter and did likewise *pro*mise to leaue vnto this Comp^lt^. and his wyffe the some of two hundred poundes or thereabout*es* after his deceasse, And that the said def^t^ is truely indebted vnto this Comp^lt^. in the somme of fforty shillinges w^thout^ that that this Comp^lt^. was desiered by the said def^t^ to come to anie accompte or gaue the said def^t^ any ill languages as in & by the said Answere is allsoe Alleadged, And w^thout^ that that any other matter thinge or thinges Clause sentence, Article or allegacion in the said Answere Conteyned materiall or effectuall in the lawe to be replyed vnto, and not heerein sufficiently replyed vnto Confessed

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and avoyded denyed or trauersed is true, All and euery wch matters hee this Compl^t^. is ready to averr iustify mayntayne and proue as this honorable Courte shall award, And humbly prayeth as hee before by his said Bill of Complaynte hathe allready prayed./

Raf Wormlaighton

[10]

REJOINDER.

[No date.]

The reioynd^r^ of Christopher Mountioy defendn^t^ to the Replica*cion* of Stephen Belot Compla*inant*

The sayd Defendaunte not acknowledgeing any thing in the sayd Replecation materially alledged to be trew in such sort as in and by the sayd Replication is aledged for reioynd^r^ thervnto sayth in all thing*es* as in his Aunsweare he hath sayd and doth and will averr mayntayne and prove his sayd Aunsweare and every matter Artickle and thinge therein Contayned to be true Certaine and sufficient to be Replyed vnto in manner and forme as therein is sett forth affirmed and Declared with that that this Defendaunt will mayntaine and prove that the sayd Complainnant*es* frend*es* did promis to fynde the sayd Complaynaunte apparrell as in and by this Defendaunt*es* aunsweare is affirmed and that this Defendaunt did furnish the sayd Complainaunte with mony at the time of his travell*es* into Spayne and that this Defendaunte and his then wife was then moved and and earnestly solisited by the sayd Complaynaunte to Consente to his Maryage of theire Daughter and the Complainanaunte not drawene therevnto by this Defendaunte, and that this Defendaunte did give vnto the sayd Complainaunte houshould stuffe and oth^r^ good*es* and Did make such Conclusion*es* and agreement*es* wth the sayd Compla*ina*nte as in and by the sayd aunsweare is truly affirmed and this Defendaunte was also desiered by the Complaynaunte to pay vnto the Bruer three pound*es* for the Debt of the sayd Complaynaunt and payd it as in his sayd Defendaunt*es* Aunswer

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is lykewyse most truly affirmed w^th^out that that this Defendaunte did ev^r^ p*ro*mise three score pound*es* or any other somes of mony vnto the sayd Complainaunte eith^r^ in marriage with his sayd Daughter or after his Death or is indebted vnto the Complaynaunte in the som*m*e of fforty pound*es* or any other some what soever as in and by the sayd Bill and Replication is falsly surmysed all which matters this Defendaunte is ready to averr mayntayne and prove as this Honorable Courte shall award and humbly prayeth as in his sayd Answeare he hath prayed.

George Hartoppe

[11]

Process Book, 6–11 James I, Miscellaneous Books, vol. 183, fo. 269.

[Summons to Shakespeare and others, Easter Term, 10 James I.]

Septimo die Maij/

Nil paup*er*	A compulsory to Will*ia*m Shakespeare gent and others ad testificand*um* inter Stepha*nu*m Bellott q*uerentem* et Xpoferum Mountioy def*endentem*	r Imed

[The note of "nil pauper" refers to the complainant. The note at the right means "returnable immediately."]

[12]

Witness Book, 44 Elizabeth to 16 James I, Miscellaneous Books, vol. 199.

[Shakespeare and others in the Court's list of witnesses examined *ex parte* Belott, Easter term, 1612.]

Stephen Belott pl*aintiff*	danyell Nicholas
XpoferMountioy def^t^.	Johan Johnson vx*or*
	Tho: Johnson
	Will*ia*m Shakespeare gent

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[13]

INTERROGATORIES.—FIRST SET.

[*Ex parte* Belott, for 11 May, 1612. Written on parchment, and attached to the following "paper" depositions.]

Jnterrogatories to bee mynistred to Wittnesses to bee p*ro*duced on the parte and behalf of Stephen Belott Complt. against Christopher Mountioye Deft.

1 Jmprimis whether doe you knowe the parties plt. and deft. and howe longe haue you knowne them and either of them.

2 Jtem whether did you knowe the Complt when he was servant wth the said deft howe and in what sort did he behaue himselfe in the service of the said deft and whether did not the said deft. Confesse that hee had got great p*ro*fitt and Comodytie by the service of the said Complt.

3 Jtem whether did not the said deft seeme to beare great good will and affeccione towarde*s* the said Complt during the time of his said service and what report did he then giue of the said Complt touching his said service and whether did not the said deft make a mocion vnto the said Complt of marriage wth the said Mary in the Bill mencioned being the said deft*es* sole Child and daughter and willingly offer to p*er*forme the same yf the said Complt. should seeme to be content and well lyke thereof. and whether did not hee lykewise send anie p*er*son or noe to p*er*swade the said Complt. to the same. declare the truthe of yor knowledge herin.

4 Jtem what some or somes of moneye did the said deft p*ro*mise to giue the said Complt. for a porcion in marriage wth the said Marye his daughter whether the some of threscore pownd*es* or what other somme as you knowe or haue hard and when was the same to be paied whether at the daie of Marriage of the said Complt and the said Marye or whath other tyme and what further porcion did the said deft p*ro*mise to giue vnto the said Complt wth the said Marye at the tyme of his decease whether the some twoe hundred pound*es* or what other somes and whether vppon the

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said p*er*swaci*o*nes and promisses of the said deft. did not the said Complt shortly after marrye wth her the said Marye declare the truthe herein as you knowe verylie believe or haue Credybly hard.

5/ Item what p*ar*cells of good*es* or houshold stuffe did the defendt promise to geue vnto the compl*ainant* in Marriadge wth his said wiefe And what p*ar*cells of good*es* did he geue him in Marriage wth his said wyffe. did he not geue them these p*ar*cels (vizt.) One ould ffetherbed, one oulde ffether boulster, A flocke boulster, a thine greene Rugg, two ordanarie blanckett*es* woven, two paire sheetes, A dozine of napkines of Course Dyap*er*, twoe short table Clothes, six short Towelles & one longe one, An ould drawinge table, two ould Joyned stooles, one Wainscott Cubberd, one Twistinge wheele of woode, twoe paire of litle Scyssers, one ould Truncke and a like ould Truncke./ One Bobbine box: And what doe youe thincke in yor Conscyence all these said parcelles might be woorthe at the tyme when they weare deliu*er*ed by the defendaunt*es* appoyntm^{t}, vnto the pl*aintiffes* declare the truthe hearein at lardge./

[14–16]

DEPOSITIONS.—FIRST SET.

[*Ex parte* Belott, 11 May, 1612. Written on paper sheets 12¼ × 15¾, and attached to the preceding skin of interrogatories.]

Depositione*s* Capt*ae* ap*u*d Westm*onasterium* vndecimo die maij A*nn*° Regni Jacobi R*egis* Angl*iae* &c decimo et Scot*iae* xlv^{to} ex p*ar*te Stephanei Bellott q*uaerentis* vers*us* Christopheru*m* Mountioye de*fendentem*

[14]

Johane Johnsone the wyffe of Thomas Johnsone of the p*ar*ishe of Elinge in the Countye of Midd*lesex* Baskettmaker of the Age of ffortye yeres or th^{r}about*es* sworne and examyned the daye and yere abouesaid deposeth and say[th]

1/ To the ffirst Jnterr*ogatory* this depon*ent* sayth she knoweth the pl*aintiff* and [hath] knowne him about Eight yeres./ and the deft about Eight yeres./

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2/To the seconde Jnterr this depont sayth shee did knowe the pl*aintiff* when he served the deft, And sayth he behaved him selfe well and in good sorte when he served the defendt for shee was servant to the deft at the tyme./ but shee never herd the deft confesse and saye that he had greate p*ro*ffitt and Comoddytie by the pl*aintiffes* service./ And more shee cannot depose.

3/To the thirde Jnterr*ogatory* this depon*e*nt sayth that the defendt seemed to beare greate good will and affection towards the pl*aintiff* when he served him, geuinge him reporte to be A verry good servaunte for pl[ ] his service./ But that the deft moved the pl*aintiff* to Marrye wth his daughter Marye she knoweth not./ But sayth that there was a shewe of goodwill betweene the pl*aintiff* and deft*es* daughter Marye wch the deft*es* wyffe did geue Countenaunce vnto and thinke well of./ And as shee Remember*e*th the deft did send and p*er*swade one Mr Shakespeare that laye in the house to p*er*swade the pl*aintiff* to the same Marriadge./ And more shee cannott depose

4/To the iiijth Jnterr*ogatory* this depon*e*nt sayth shee never herd her [M^{r}] the def*endant* p*ro*ffer the pl*aintiff* any some of money in Marriadge [wth] his daughter Marye. but yt was Reported in the house that the pl*aintiff* was to haue wth her in marriadge the some of ffyftye pound*es*. but what tyme of paym^{t} was th^{r}of appoynted or agreed vppon shee knoweth not, nor of any p*ro*mise of any other or furth^{r} porc*i*on to be payed the pl*aintiff* eyther at the tyme of marriadge betweene them, or at the tyme of the deft*es* deceas[e] but [that] they after married togeathe^{r}./ And more shee cannott [depose]

5/To the vth Jnterr this depon*e*nt sayth shee knoweth not what p*ar*celles of good*es* and houshould stuffe the defendt p*ro*missed to geue vnto the pl*aintiff* in marriadge wth his wyffe./ But sayth the deft gaue in marriadge wth her to the def*endant* [sic] the seu*er*all p*ar*cells [of] good*es* in the Jnterr*ogatory* mencioned./ but the valewe of them she certaynlie knoweth not, but thinketh they were woorth some Eight pound*es*./ or thereabout*es*./ And more shee cannot depose./

X [Her Mark]

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[15]

Danyell Nycholas of the parishe of S^ct^: Olphadge w^th^in Criplegate London gent of the Age of ffyftye twoe yeres or th^r^aboutes sworne and examyned the daye and yere aboue said deposeth and sayth

1/To the ffirste Jnterr this deponent sayth he hath knowne the plaintiff about twenty yeres and deft about twelue yeres

2/To the seconde Jnterrogatory this deponent sayth he knewe the plaintiff servaunte vnto the defendant who behaved him selfe verry well in the defendantes service for any thinge he euer herd to the contrary And hath herd that the deft profitted well by the pltes service wth him. And more he Cannott depose./

3 To the thirde Jnterrogatory this deponent sayth he herd one W^m^: Shakespeare saye that the deft did beare A good opinnion of the plaintiff and affected him well when he served him, And did move the plaintiff by him the said Shakespeare to haue [a] marriadge betweene his daughter Marye Mountioye [and] the plaintiff And for that purpose sent him the said Sh[akespeare] to the plaintiff to perswade the plaintiff to the same, as Shakespere tould him this deponent wch was effected and Solempnized vppon promise of a porcion wth her./ And more he cannott depose./

4 To the iiij^th^ Jnterrogatory this deponnt sayth that the plaintiff did Requeste him this deponnt to goe wth his wyffe to Shakespe[are] to vnd^r^stande the truthe howe muche and what the defendant did promise [to] bestowe on his daughter in marriadge wth him the plaintiff, who did soe./ And askinge Shakespeare th^r^of, he Answered that he promissed yf the plaintiff would marrye wth Marye his the deftes onlye daughter, he the defendt would by his promise as he Remembered geue the plaintiff wth her in marriadge about the some of ffyftye poundes in money and Certayne Houshould stuffe./ And more he cannott depose touchinge the said Interrogatory to his Rememberaunce for he remembereth not any daye sett downe for paym^t^ of the porcion or deliuerye of the houshould Stuffe. but only that he would geue her soe much at the tyme of her marriadge./

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5/To the vth Jnterr*ogatory* this depon*ent* Can saye nothinge more then he hath alreddye deposed./

Daniell Nicholas

[16]

Will*iam* Shakespeare of Stratford vpon Aven in the Countye of Warwicke gen*tleman* of the Age of xlviij yeres or thereabout*es* sworne and ex*am*ined the daye and yere abouesaid deposethe & sayethe

1 To the first Jnterr*ogatory* this depon*ent* sayethe he knowethe the p*ar*tyes pl*aintiff* and deffendt and hathe know[ne] them bothe as he now remembrethe for the space of tenne yeres or thereabout*es*./

2 To the second Jnterr*ogatory* this depon*ent* sayeth he did know the comp^t^ when he was s*er*vant wth the deffendant, and that duringe the tyme of his the complt*es* service wth the said deffendt he the said Complt to this depon*entes* knowledge did well and honestly behaue himselfe, but to this depont*es* remembrance he hath not heard the deffendt confesse that he had gott any great p*r*offitt and comodytye by the s*er*vice of the said compl*ainant*, but this depon*ent* saith he verely thinckethe that the said compl*ainant* was a very good and industrious servant in the said s*er*vice And more he canott depose to the said Jnterr*ogatory*:/

3/To the third Jnterr*ogatory* this depon*ent* sayethe that it did evydentlye appeare that the said defft did all the tyme of the said complt*es* service wth him beare and shew great good will and affecc*i*on towards the said complt, and that he hath hard the defft and his wyefe diu*er*se and su*n*dry tymes saye and reporte that the said complt was a very honest fellowe: And this depont sayethe that the said deffendant did make a moc*i*on vnto the compl*ainant* of marriadge wth the said Mary in the bill menc*i*oned beinge the said defft*es* sole chyld and daughter and willinglye offered to p*er*forme the same yf the said Compl*ainant* shold seeme to be content and well like thereof: And further this depon*ent* sayethe that the said defft*es* wyeffe did sollicitt and entreat this depon*ent* to moue and p*er*swade the said Compl*ainant* to effect the said

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Marriadge and accordingly this depon*ent* did moue and p*er*swade the compl*ainant* thervnto: And more to this Jnterrogat*or*ye he cannott depose:/

4/ To the ffourth Jnterr this deponent sayth that the defendt p*rom*issed to geue the said Compl*ainant* a porc*i*on [*of monie and goodes* (stricken out in original)] in Marriadg[e] wth Marye his daughter./ but what c*er*tayne porc*i*on he Remember*i*the not./ nor when to be payed [*yf any some weare promissed,* (stricken out in original)] nor knoweth that the def*endant* p*ro*missed the [*defendt* (stricken out)] pl*aintiff* twoe hundered pound*es* wth his daughter Marye at the tyme of his decease./ But sayth that the pl*aintiff* was dwellinge wth the def*endant* in his house And they had Amongeste themselues manye Conferences about there Marriadge w^{ch} [afterwardes] was Consumated and Solempnized. And more he cann[ott depose./]

5/ To the vth Jnterr*ogatory* this deponent sayth he can saye noth[inge] touchinge any p*ar*te or poynte of the same Jnterro*gatory* for he knoweth not what Jmplen^{tes} and necessaries of household stuffe the def*endant* gaue the pl*aintiff* in Marriadge wth his daughter Maryė./

Willm Shak*sper*

[On Shakespeare's signature here, see my article in the *Nation,* 17 March, 1910, or the *Westminster Gazette,* 12 March.]

[17]

Decrees and Orders, Miscellaneous Books, vol. 26, p. 270.

[An order for publication of the preceding depositions and for hearing the case, dated 15 May, 1612.]

Decimo quinto die Maij A*nn*° R*egni* R*egis* Jacobi Angliae ffranciae et hib*er*niae decimo et Scotiae xlv^{to}./

Bellot Mountioy In the cause at the sute of Stephen Bellot compl*ainant* against Xpofer [=*Christ*ofer] Mountioy def^{t} vpon the mocion of Mr Wormeleighton of counsaill wth the said compl*ainant* yt is ordered that the same matter shalbe published vpon Wednesday next if

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then or in the meane time no matter sufficient shalbe shewed in this court in stay thereof, and it shalbe heard in this court vpon the second day of the next terme (the def^{t} having convenient notice of this order before the said day of hearing).

[18]

Decrees and Orders, Miscellaneous Books, vol, 26, p. 343.

[An order for examining further witnesses and for postponing publication and hearing, dated 15 June, 1612.]

15° Junij A° 10° et 45°

Bellot Mountioy

In the cause at the sute of Stephen Bellot compl*ainan*t against Xpofer Mountioy def.^{t} vpon the mocion of m^{r} Wormeleightin of counsaill wth the said compl*ainan*t it is Ordered (any form*er* order notwthstanding) that both the said p*ar*ties shall haue further day to examine all such witnesses as they intend to vse in this cause, vntill saterday next, And then the same matter shalbe published and not before & it shalbe heard in this court vpon the saterday next before thende of this p*re*sent terme p*er*emptorily.

[19]

Witness Book, 44 Elizabeth to 16 James I, Miscellaneous Books, vol. 199.

[The Court's list of witnesses examined *ex parte* Bellott, Trinity Term, 1612.]

Stephen Bellott pl*aintiff*	Humfrey ffludd
	danyell Nich*o*las
	George Wilkins
	Will*i*am Eaton
Xpofer Mountioy deft.	Xpofer Weaver
	Nowell Mountioy

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[20]

INTERROGATORIES.—SECOND SET.

[*Ex parte* Belott, for 19 June, 1612. Written on parchment, and attached to the following set of depositions.]

Inter to bee mynistred to witnesses to bee *pro*duced on the parte and behalfe of Stephen Bellott Comp^lt^ againste Christopher Mountioy def^t^.

1 Inpri*mis* whether doe you knowe the parties p^lt^. and def^t^ and howe longe haue you knowen them and ither of them?

2 Itm of what estate or abillity is the said def^t^ accompted to bee of and what Lease or Leases of howses or ten*ementes* hathe hee, and where doe the said howses or ten*ementes* lye, and what is the yeerely vallue thereof? and what tyme or tymes are to come in the said Leases and whether doe you not thinke that the said def^t^ receiueth fforty pound*es* p*er* ann*um* de claro by his said Leases? or howe muche dothe hee receiue by the same as you haue Credibly heard or verily beleeue in yor Conscience to bee true, and whether hathe not the said def^t^ giuen forthe speaches that hee will rott in prison before hee will giue any thinge vnto the said Comp^lt^ yf the Cause should bee decreed agaynste him in this honorable Courte declare the truthe of yor knowledge herein as you knowe verily beleeue or haue Credibly heard./

Humphrey fflude 3 Itm who apparelled the said Comp^lt^. duringe the tyme of his seruice wth the said def^t^? whether not the ffrends of the said Comp^lt^. and for howe longe tyme did the said Comp^ltes^ ffrend*es* soe fynde him wth apparell? whether not duringe the terme of two yeares or howe muche longer declare the truthe of yor knowledge therein.

4 Itm whether did not the said def^t^ or some other by his appointment send you or any other p*er*son to yor. knowledge vnto the said Comp^lt^. to make a mocion of marriadge betwixt the said Comp^lt^. and the said Mary Mountioy beinge the def^tes^ sole Childe and daughter, and what wordes did the said def^t^ vse vnto you or

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to any other to yor. knowledge touchinge the marryage of the said Comp^lt^. wth the said Mary? whether did not the def^t^ then say that yf shee the said Mary did not marry the said Comp^lt^., that
William Shakespeare 4. shee the said Mary should not Coste him nor haue a groate from him, and whether did not the said def^t^ likewise promise that yf the Comp^lt^. and the said Mary did marry together then hee would giue a porc*i*on wth the said Mary vnto the said Comp^lt^.? howe muche was the said porc*i*on that hee then promised, whether not the somme of threescore pounds or what other somme as you thinke in yor. Conscience to bee true? and before whome did the said def^t^ soe promise the same, whether before you or any other to yor. knowledge, and whether vppon the said promisses and perswac*ions* did not the said Comp^lt^. Contracte himselfe wth the said Mary?

George Wilkins 5 Itm whether after the marriadge betwixt the said Comp^lt^. and the said Mary did the said def^t^ giue any goods or howsehold stuffe to the said Comp^lt^. and his wyffe? yf yea, to what vallue did the said goods or howsehold stuffe amounte vnto, whether vnto the somme of ffiue pounds or to what other somme declare the truthe of yor. knowledge herein./

[21-26]

DEPOSITIONS.—SECOND SET.

[*Ex parte* Belott, 19 June, 1612. Written on paper 12¼ × 15¾, and attached to the preceding skin of interrogatories.]

Depositio*nes* Capt*ae* ap*ud* Westm*onasterium* decimo nono die Junij A*nn*° Regni Jacobi R*egis* Angl*iae* &c decimo et Scot*iae* xlv^to^: ex p*ar*te Stephani Beliott q^rt^ vrs Christopher*um* Mountioye deft

[21]

Dannyell Nicholas of the p*ar*ishe of S^ct^: Alphadge w^th^in Criplegate London gent of the Age of threeschore and twoe yeares or thereabout*es* swoorne and examyned the daye and yeare abouesaid deposeth and saythe./

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1/ To the ffirste Interr this deponent sayth he hath knowne the plaintiff twelue yeares, and the defendt about twentye yeares.

2/ To the seconde Interr this deponent sayth that the defendt is Amongest his neighboures thought to be a Suffitient man in estate and abillitie, and Reporte is amongste the neighboures that he hath Diuerse leases neere about wheare he dwelleth and at Braynforde woorthe by reporte thirtye poundes per Annum or thereaboutes. And by reporte he hath latelie takne newe leases of them./ but what yeares are yett to come in them his leases this deponent knoweth not./ And sayth he thinketh in his Conscyence the defendt Receiveth about thirtye poundes yerely Rent de Claro for the same houses/ And sayth he herd one Christopher Weaver saye that the defendt hadd A good estate to paye euerye man his owne and to geue the plaintiff his porcion yf he pleased./ but the defendt hadd made an othe that Althoughe the Lawe gaue him the plaintiff his porcion, he the deft would Rott in prison before he would geue the plaintiff any one groate thereof./ And more he Cannott depose

3/ To the thirde Interr this deponent sayth that the pltes ffath^{r} in Lawe Humphrey ffludd, reported in this deponentes presentes & the presentes of others that he the plaintiff was often and seuerall tymes Apparrelled by him the said Homphrey ffludd and the plaintiffes mother and others of the plaintiffes ffrendes, duringe the moste parte of the tyme of his service wth the defendt./ And more he cannott depose touchinge the same Interr./

4 To the iiijth Interr this deponnt sayth that the defendt did never send him this deponnt vnto the Complainant to make mocion of Marriadge betwixte the Complainant and the said Marye Mountioye beinge the defendtes sole daughter and Childe but M^{r}: William Shakespeare tould him this deponent that the defendt sent him the said Mr Shakespeare to the plaintiff about suche a marriadge to be hadd betweene them, And Shakespeare tould this deponent that the defendt tould him that yf the plaintiff would Marrye the said Marye his daughter he would geue hime the plaintiff A some of money wth her for A porcion in Marriadge wth her./ And that yf he the plaintiff did not marry wth her the

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said Marye and shee wth the pl*aintiff* shee should never coste him the deft her ffather A groat, wherevppon And in Regard Mr Shakespeare hadd tould them that they should haue A some of money for a porc*i*on from the fath^r^ they weare made suer by Mr Shakespeare by geuinge there Consent, and agreed to Marrye, [*geuinge eache others hand to the hande* (stricken out in original)] And did marrye./ But what some yt was that M^r^ [*Shake* (stricken out)] Mountyoye p*ro*missed to geue them he the said Mr Shakespeare could not remember, but said yt was ffyftye pound*es* or th^r^abou*tes* to his beste Remember*a*unce./ And as he Remember*i*th Mr Shakespeare said he p*ro*missed to geue them A porc*i*on of his good*es*: but what, or to what valewe he Rememberithe not/ And more he Cannott depose./

5 To the vth Interr this depon*e*nt sayth that after the Marriadge Solempnized betweene the pl*aintiff* and Marye, one George Wilkins tould him this depon*e*nt that the defendt gaue them some Implem^tes^ belonginge to household, wch good*es* weare in his the said Wilkins Custody, wch good*es* the said Wilkins Reported he would not haue geuen ffyve pound*es* ffor./ And more he cannott depose

Daniell Nicholas

[22]

William Eaton apprentice wth the Compl*ainan*t of the Age of nynteene yeres or th^r^abou*tes* sworne and examyned the daye and yere abouesaid deposeth and saythe./

1/ To the ffirste Interr this deponnt sayth he hath knowne the plt ffyve yeres or th^r^abou*tes*. And the def*endan*t about ffoure yeares and A halfe./

2/ To the seconde Interr this depon*e*nt sayth he cannot c*er*taynlie depose any thinge touchinge the deft*es* estate or habillitie. only sayth he knoweth the deft hath A house in Muggle streete & in Silver Streete London and another at Branforde, but what they are woorth by the yeare he knoweth not./ nor hath herd the deft vse any such speeches as in the Interr*ogatory* is vrdged/ And more he Cannott depose.

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3 To the thirde Interr this depon*e*nt Can saye nothinge./

4 To the iiijth Interr this depon*e*nt sayth he hath herd one Mr Shakspeare saye that he was sent by the defendt to the pl*aintiff* to moue the pl*aintiff* to haue A marriadge betweene them the pl*aintiff* and the defendt*es* daughter Marye Mountioye, And herd Mr Shakespeare saye that he was wished by the deft to make p*r*offer of A certayne some that the defendt said he would geue the pl*aintiff* wth his daughter Marye Mountioye in Marriadge, but he had forgott the some./ And [*m^{r} Shakespeare tould the plt* (stricken out in original)] more he cannott depose touchinge the same Interr*ogatory*./

5/ To the vth Interr this deponnt Can saye nothinge of his owne knowledge nor by Credible reporte./

william Eyton

[23]

George Wilkins of the p*a*rishe of S^{ct}. Sepulchers London Victuler of the Age of thirtye Syxe yeres or th^{r}about*es* sworne and examyned the daye and yere abouesaid deposeth and saythe./

1/To the ffirste Interr this depon*e*nt sayth he hath knowne the pl*aintiff* about Seaven yeres and the deft as longe./

2. 3. 4./To the second, third and ffourth Interr this depon*e*nt is not examyned at the Requeste of the pl*aintiff*./

5 To the vth Interr this depon*e*nt sayth that after the plt was married wth Marye the deft*es* daughter he the pl*aintiff* and his wyffe came to dwell in this deponnt*es* house in one of his Chambers. And brought wth them A fewe good*es* or houshould stuffe wch by Reporte the defendt her fath^{r} gaue them, ffor wch this depon*e*nt would not haue geuen Aboue ffyve pound*es* yf he had bene to haue bought the same./ And more he cannott depose touchinge the same Interr:/

George Wilkins

[24]

Humfrey ffludd of the p*a*rishe of S^{ct}: Gyles wthout Criplegate one of his Ma^{tse}: Trumpetores of the Age of ffyftye three yeres or

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th^r about*es* sworne and examyned the daye and yere abouesaid deposeth and saythe

1/To the ffirste Interr this depon*e*nt sayth he hath knowne the pl*aintiff* about Eighteene yeares for he married his mother in ffraunce And the defendt he hath knowne about Eighteene yeres for he put the pl*aintiff* to be the defendt*es* apprentice./

2/To the seconde Interr this depon*e*nt is not examyned at the Requeste of the plt./

3/To the thirde Interr this deponnt sayth that whileste the pl*aintiff* was in service wth the defendt, this depon*e*nt gaue the pl*aintiff* three suyt*es* of Apparrell vz twoe Cloak*es*, And three suyt*es* of Apparrell. And his mother gaue him good store of Lynnen wch apparrell and lynnen Could not serve him lesse than three yeres, besid*es* the deft was so Stricte vnto him that he this depon*e*nt and the pl*aintiffes* mother weare fayne manye tymes to geue him monney and to paye the Barber for Cuttinge the hayr of his heade./ And more he cannott depose./

4. 5/To the iiij^th^ and v^th^ Interr this depon*e*nt is not ex*a*mined at the Requeste of the pl*aintiff*./

Homfrey Fludd

[25]

Christopher Weaver of the p*a*rishe of S^ct^: Olaves in Sylver Streete London m*e*rcer of the Age of thirty Eight yeres or thereabout*es* sworne and examyned the daye and yeare abouesaid deposith and sayth

1/To the ffirste Interr this deponnt sayth he hath knowne the pl*aintiff* about twelue yeres and the deft about Syxteene yeares./

2/To the seconde Interr this depon*e*nt sayth he knoweth not the deft*es* Estate, but sayth he hath the lease of his house wherin he dwelleth And A lease of A house in Braynford in the County of Midd*lesex* But he knoweth the deft hath lyen at Intereste these three or ffoure yeres for twenty pound*es* in one place, and hath neyther payed the principalle nor Interest money due for the same./ And lykewise hath takne vpp other monney, And soulde his plate and some houshould stuffe./ And furth^r^ sayth

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that he herd that the deft payeth yerelye Rent for those leases some Seaventeene pound*es* p*er* Ann*um*./ And sayth that he thinketh the deft Receaveth some Eighteene pound*es* p*er* Ann*um* de Claro besid*es* his owne dwellinge and hath A Soiourner in his house wth him but what p*r*offitt he maketh th^{r}by he knoweth not./ And sayth the deft hath said in this deponnt*es* hereinge that in Regard the pl*aintiff* and his daughter had vsed him so vnkindlie, And in Regard he p*ro*missed them nothinge he would Rather Rott in prison then geue them any thinge more then he had geuen them before/ And more he cannot depose./

3 To the thirde Interr this depon*ent* sayth he hath herd the deft saye that after the pl*aintiff* came to be his apprentice he ffound the pl*aintiff* all his wearinge apparrell. And oth^{r}wise he Cannott depose touchinge the same Interr./

4 To the iiijth Interr this depon*ent* sayth he was never made an Instrum^{t} betweene the pl*aintiff* and the deft by the deft*es* ap-poyntm^{t} for the moveinge of A marriadge betweene the pl*aintiff* and deft*es* daughter And more he cannott depose touchinge any p*ar*te of the same Interr for that he never herd the deft p*ro*mise the pl*aintiff* any some of monney or other thinge wth his daughter Mary in Marriadge wth the pl*aintiff* nor saye that yf she married not the pl*aintiff* shee should not coste him A groate/

5 To the vth Interr this depon*ent* sayth he hath herd the deft and his wyffe saye that they gaue the pl*aintiff* wth there daughter Marye in marriadge the some of ten pound*es* in monney and houshould Stuffe of moste sort*es* somthinge viz in monney and good*es* to the valewe of thirtye pound*es* And more he Cannott depose to his Remember*a*unce/

Chr: Weauer:

[26]

Nowell Mountioye of the p*ar*ishe of S.^{ct} Olaves in Sylver Streete London Tyremaker of the Age of thirtye yeares or th^{r}about*es* sworne and examyned the daye and yeare abouesaid deposith and saythe./

1/To the ffirste Interr this depon*ent* sayth he hath knowne the

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pl*aintiff* about ffyfteene yeres and the deft longer for he is this depone*nte*s brother./

2/To the seconde Interr this depone*n*t sayth that his broth^{r} the deft*e*s estate is not muche ffor he hath but the lease of twoe houses one lease of the house wherein he dwelleth devided into twoe tenem*entes* and a lease of a house in Brainforde by wch leases he gaineth An ou*er*plus of Rent more then he payeth to the valewe of about nyntene or Seaventeene pound*es* p*er* Ann./ And hath A tyme in his lease of the howse wherein he dweleth of some thirty yeres to come wch he renewed but latelie, but howe longe tyme he hath to come in the house he hath at Brainford he knoweth not./ Albeyt the deft is much in debte, And sould or pawned his plaite A greate whileste sync so that his estate cannot be verry greate./ And sayth that he herd his brother the deft saye that yf he weare Condempned in this suyte vndeserved he would lye in prison before he would gyve the pl*aintiff* any thinge./ And more he Cannott depose./

3./To the thirde Interr this depone*n*t sayth that the pl*aintiff* was A yeare A boorder in the deft*e*s house before he became the deft*e*s Apprentice duringe wch tyme he beleveth the deft did not apparrell the pl*aintiff:* but after the pl*aintiff* became the deft*e*s s*er*vaunte the deft apparrelled him Albeyt his ffrind*e*s might send him somtymes A Cloake or payre of Stocking*e*s or such a thinge./ wch he knoweth to be true for that he did s*er*ve the deft when the plt served him. And knewe the truth th^{r}of: And more he Cannott depose./

4/To the iiij^{the} Interr this depone*n*t sayth he was never sent by the deft vnto the Complt to make A mocon to him of A marriadge to be hadd betwixte the Compl*ainan*t and Marye Mountioy the deft*e*s sole Child and daughter, nor knoweth of any other that was by the defendt sent vnto the pl*aintiff* vppon that messaiege: but the plt tould this deponnt that one Mr Shakespeare was Imployed by the deft about that buysnes: in what mann^{r}: or to what effecte he knoweth not: And sayth he never herd the deft saye that yf his daughter Mary married not wth the pl*aintiff* shee should neve^{r} haue groate from him./ nor knoweth that the de-

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fendant promissed to geue the pl*aintiff* Any porcion of monney wth his daughter Mary in marriadge nor howe much he promissed yf he promissed any, nor knoweth vppon what promise the Complt contracted him selfe wth the said Marye/. And more he Cannott depose.

5/To the ffyfte Interr this deponnt sayth that after the pl*aintiffes* marriadge wth the said Marye, he this depon*ent* went to see them, And the pl*aintiff* vppon some speeches betweene this depon*ent* and the pl*aintiff* the pl*aintiff* tould him that the de*fendant* had geuen him wth his daughter in marriadge the some of ten pound*es* and Certayne houshould stuffe, but the valewe of the houshould stuffe he knoweth not./ And more he Cannott depose./

Nouel Montioi

[27]

Witness Book, 44 Elizabeth to 16 James I, Miscellaneous Books, vol. 199.

[The Court's list of witnesses examined *ex parte* Mountjoy, Trinity Term, 1612.]

Xpofer Mountioy deft	Xpofer Weaver
	Nowell Mountioy
Stephen Bellott pl*aintiff*	Thomas fflower.

[28]

INTERROGATORIES.—THIRD SET.

[*Ex parte* Mountjoy, for 23 June, 1612. Written on parchment, and attached to the following depositions.]

Interrogatories to be ministred vnto witnesses produced on the parte and behalf of Christopher Mountioy de*fendant* to the bill of Complaynt of Stephen Bellott Comp.^lt^./

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1. Inprimis whether do yo^{u} knowe the parties plantiffes and defend^{t}./
2 Item whether did yo^{u} not heare or knowe that Mary the late wief of Christopher Mountioy the def^{t} did in her life tyme vrdge the said defend^{t} to give somthinge more vnto Bellott the plt./ and his wief then he had donn, and did not the said Mountioye the defend^{t} aunswere her that he would never promise them anie thinge: because he knewe not what he should neede himselfe? or what other speaches to that purpose did you heare her or anie other speake and when were they spoken declare the whole truth therein accordinge to yor remembrance
3 Item have you not heard the late wief of Christopher Mountioy the defend^{t} declare what her then husband the said Christopher Mountioy and shee had given the said Complt and his wief after theire Marriage and that shee would have had the said Christopher Mountioy her then husband to have given them more but he vtterly refused and would not or what other speaches have yo^{u} heard her say touchinge that matter declare the whole truth in particuler as yo^{u} remember?
4 Item do yo^{u} knowe or haue yo^{u} heard of anie monie or other goodes wch the said Comp.^{lt} Bellott hath receaved of the said Christopher Mountioy the defend^{t} or his late wief and whether were those sommes of monie or other goodes delivered to them and what was the vallewe of them declare yor whole knowledge herein?/
5 Itm hath not the Complaynant Stephen Bellott vrdged or perswaded yo^{u} to Conceale yor knowledge or otherwise to depose or speake somthinge Concerninge the matter nowe in question betweene him and the said Mountioy the defend^{t} wch yo^{u} knowe not to be truee and what speaches hath he lately vsed, or spoken vnto yo^{u} to that or anie such purpose and when did he speake them declare the premisses hereof according to yor knowledge?/
6 Item whether did yo^{u} heare or knowe that the said Christopher Mountioy the defend^{t} did by himselfe or anie from him desire the said Stephen Bellott the Comp^{lt} to reccon wth him about the monie and other things due betweene them and what aunswere did the said Bellott make therevnto and whether do yo^{u} knowe

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or haue heard that the said Bellott hath Confessed that he did owe the said Mountioy anie monie or other thing*es* and what was that monie and other thinges and when did he Confesse it and what speaches have yo^{u} heard the said Bellott speake Concerninge the Reconinge or difference betweene the said Mountioy and him and when did he speake them declare yor whole truthe herein?/

7 Item did not yo^{u} of yor voluntary will and disposition to make the pl^{t}. and defend^{t} frend*es* goe to the pl^{t}. about three week*es* since and tould the pl.^{t} that he tooke a wronge Course to sue his Father in Lawe And that it weare better they weare kinde and Lovinge frend*es* and what aunswere made the plantiff vpon yor Conference wth him thereabout declare yor knowledge?/

[29–31]

DEPOSITIONS.—THIRD SET.

[*Ex parte* Mountjoy, 23 June, 1612. Written on paper 12¼ × 15¾, and attached to the preceding skin of interrogatories.]

Depositione*s* Capt*ae* ap.^{d} Westm*onasterium* xxiij^{tio} die Junij A*nno* Regni Jac*obi* R*egis* Angl*iae* &c decimo et Scot*iae* xlv.^{to} ex p*ar*te Christopheri Mountioy def*endentis* vrs Stephanu*m* Bellott q*uaerentem*./

[29]

Christopher Weaver of the p*ar*ishe of S^{ct} Olaves in Sylver Streete London m*er*cer of the Age of thirtye Syxe yeres or th^{r}about*es* sworne and examyned the daye and yere abouesaid deposith and saythe

1/To the ffirste Interr this depon*ent* sayth he knoweth the pl*aintiff* and def*endant*./

2/3/4/5/To the ij.^{d} iij.^{d} iiij.th v.th and vjth Interr this depon*ent* is not examined at the Request of the deft

7/ To the vijth Interr this depon*ent* sayth that about three week*es* synce he this depon*ent* wishinge well to bothe the pl*aintiff* and deft went of his owne voluntary will and disposition to talke wth

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the pl*aintiff* and to see yf he could bringe them to be frind*es* And Questioninge wth the pl*aintiff* About the same vnkindnes and shewinge him that he tooke A wronge Course to sue his ffath^{r} in Lawe, the pl*aintiff* Answeared him this depon*ent* that he would never haue sued his ffath^{r} in Lawe yf his ffath^{r} in Lawe would haue bene willinge to haue hadd his Companye in ffamilliar mann^{r} as at his table./ And said further he Could be contented the matter should be Ended betwixte them, so that his ffath^{r} would lett him dwell in one of his houses, wch was nexte to his owne dwellinge house payinge some Rent for yt, And furth^{r} said he could leave his wyffe in better estate then he ffound her whensoeuer god should be pleased to calle him, vnto wch this depon*ent* said he was gladd of yt, And said he this depon*ent* would make yt knowne to the deft his ffather. And do what he could to make them ffrind*es* or woord*es* to that effecte And soe did, but the def^{t} yt seemed had taken such an vnkinnes at his sonne in lawes vsage toward*es* him that he said he would never geue him Any more, As before he hath deposed in his Answeare to the plt*es* Interr. And more he Cannott depose.

Chr: Weauer

[30]

Nowell Mountioy of the p*ar*ishe of S^{ct}: Olaves in Sylver Streete London Tyremaker of the Age of thirtye yeres or th^{r}about*es* sworne and examyned the daye and yere abouesaid deposeth and saythe

1/To the ffirste Interr this depon*ent* sayth he knoweth the pl*aintiff* and de*fendan*t./

2/3/ To the seconde and third Interr this depon*ent* Can saye nothinge touchinge any p*ar*te of the same Interr

4/To the iiijth Interr this depon*ent* sayth that the pl*aintiff* since his marriadge wth the deft*es* daughter Marye tould this depon*ent* that the deft had geuen them the pl*aintiff* and his wyffe the some of ten pound*es* in monney and Certayne houshould stuffe but the valewe of the houshould stuffe he cannott declare, for that he did not see the household stuffe deliu*er*ed./ And more he Cannott depose

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5 To the ffyfte Interr this depon*ent* sayth that the pl*aintiff* sent for him this depon*ent* about A yere since wch he thinketh is neere about or synce this suyte beganne. And asked this depon*ent* yf he knewe of the tenn pound*es* the deft his ffath^{r} in lawe gaue him and his wyffe synce there Marriadge./ And this depon*ent* tould the pl*aintiff* he did knowe of yt, wherevppon the pl*aintiff* tould him this depon*ent* that yf when he was called to Answeare wherefore yt was geuen them, he this depon*ent* might doe him the pl*aintiff* good yf he this depon*ent* would Answeare that he the pl*aintiff* Receaved yt of the deff*endant* for woorke donne for him, sayinge to this depon*ent* that he the pl*aintiff* was lykelie to be A better ffrind to this depon*ent* then the deft would be, vrdginge that the deft was all for him selfe./ And furth^{r} that synce that tyme the plt*es* mayd lykewise vrdged this depon*ent* that shee herd him saye that he herd the deft saye that he gaue the pl*aintiff* that ten pound*es* aforesaid for woorke: wch was ffalse: ffor wch this depon*ent* Rebuked the mayde. And more he Cannott depose./

6/To the vjth Interr this deponnt sayth that the plt tould him that the deft came vnto him And desired him to Reccon wth him About monney And other thing*es* betweene them/ And the pl*aintiff* tould this depon*ent* that he Answeared him the deft that he would not Reccon wth him any thinge, sayinge he was sorry he hadd not more in his hand*es* to Reccon wth him for then he hadd sayinge he saies I owe him three pound*es*, & he oweth me fforty shilling*es*, yf all come to all tis but twenty shilling*es* difference./ And more he cannott depose touchinge the said Interr to his Remember-aunce./

7/To the vijth Interr this depon*ent* is not examyned at the Requeste of the def*endant*

Nouel Montioi

[31]

Thomas fflower of the p*ar*ishe of S^{et} Albans in Woddstreete London m*er*chaunttaylo^{r} of the Age of thirtye Eight yeres or th^{r}about*es* sworne and examed the daye and yere abouesaid deposith and saythe/

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1/To the ffirste Interr this depon*ent* sayth he knoweth the pl*ain-tiff* and deft

2/To the seconde Interr this depon*ent* sayth that he hath often herd Marye the defendt*es* wyffe did often in her lyffe tyme vrdge her husbond the deft to geue somthynge more vnto the pl*aintiff* and his wyffe then he had donne before wherevnto the deft Mountioye would comonlye answeare her that he would not pr*o*mise them any thinge because he knewe not what he should neede him selfe./ And soe he hath herd the deft often saye he would pr*o*mise nothinge for feare of wantinge him selfe or woord*es* to the lyke effecte./ And more he Cannott depose./

3/To the third Interr this depon*ent* sayth he hath herd the deft*es* wyffe in her lyffe tyme saye that her husbonde and shee hadd geuen her daughter Marye and her husbond the pl*aintiff* synce there marriadge togeath^{r} the some of ten pound*es* in Monney And Certayne Implem^{tes} of houshould stuffe, And that shee would haue had her husbond Mountioye haue geuen them more./ but he would not sayinge he knewe not what he him selfe might want or word*es* to the lyke effecte. And more he Cannott depose/

4To the iiijth Interr this depon*ent* sayth that he herd as aforesaid that the pl*aintiff* Receaved of the deft ten pound*es* in monney and Certayne housheould stuffe./ but the valewe of the houshould stuffe he knoweth not./ And furth^{r} sayth that synce the pl*aintiffes* goinge from the deft the deft sent this depon*ent* to the pl*aintiff* to desire him to Reccon wth him for some Monney and other thing*es* wch he had takne wth him when he went Awaye./ And the pl*aintiff* did answeare this depon*ent* that he had but some fewe trifles of his wch he would not confesse in p*ar*ticuler nor deliu*er*. And more he Cannott depose/

5To the vth Interr this depon*ent* sayth the pl*aintiff* hath not at any tyme vrdged nor p*er*swaded this depon*ent* to conceale his knowledge nor otherwise to depose and speake Any thinge conc*er*ninge the matt^{r} nowe in Question betweene them./ And more he cannot depose./

6/To the vjth Interr this depon*ent* sayth that by him this depon*ent* the defendt did longe synce desire the pl*aintiff* to Reccon wth him

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the de*fendant* about monney And other thinge*s* due betweene them, wherevppon this deponnt moved him to A Recconinge, who Answeared in mann^r^ ffollowinge vz wheare I haue a penniwoorth of Any thinge, I would I hadd more of his I haue nothinge but that wch I will keepe And yf I owe him Any monney lett him com by yt as he Can./ wch Answeare this depone*nt* retorned the deft. And more he cannot depose.

7To the vij^th^ Interr this depone*nt* is not examned at requeste of the de*fendant*./

Thomas fflowers

[32]

Decrees and Orders, Miscellaneous Books, vol. 26, p. 421.

[An order referring the matter at variance to the French Church in London for hearing,, ordering, and final determination, dated 30 June, 1612.]

Tricesimo die Junij A° p*raedicto*./

Bellot Mountioy

In the matter of varyance brought before the King*es* ma^tie^ and his highenes Counsaill in his ma^tes^ ho: Court of Whitehall by Stephen Bellot compl*ainant* against Xpofer Mountioy def^t^, the said compl*ainant* by his bill seeking to be releived touching A promise supposed by the said bill to be by him the said def^t^ Mountioy made for the payment vnto the said compl*ainan*^t^ of the som*m*e of threescore pound*es* or theareabout*es* vpon the day of the said compl*ainan*^tes^ mariage wth Mary Mountioy daughter of the said def^t^ & now wief of the compl^t^, And for the leaving to the said compl*ainan*^t^ & Mary his wief the some of CC^l^ more at the tyme of his the said def^tes^ decease, As in & by the said bill of complaynt more at lardge appeareth. Vnto wch bill the said def^t^ appeared & answered, witnesses on both p*artes* were exa*min*ed and A day of hearing appoynted. Vpon opening whereof Jt is by his ma^tes^ said Counsaill of this Court in p*rese*nce of the said p*ar*ties and of Counsaill learned on both sydes ordered by and wth the full consent of the saide p*ar*ties, that the same matter shalbe referred to the hearing ordering & finall determina-

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cion of the Reverend & grave overseers and Elders of the french Church in London aucthorising them hereby to call before them both the saide parties, And vpon consideracion had of the state of the same cause & the circumstances of the same, to heare Order & finally determine the said matter touching the promise as to their discrecions & wisdomes shall seeme convenient, And such order as shalbe herein determined by the said Committees this court will confirme establishe & decree./

[33-37]

Registers of the Consistory of the French Church of London, 1588–1615.

[Preserved in the Library of the French Protestant Church of London, Soho square, W. Written usually in plain Roman letters, except a part, as for example the notice of 2 Sept., 1613, in a flourished court-hand of Gothic-Roman, very difficult to read.]

Ce Liure Contient Les Actes du Consistoire de L eglise françoise De Londres Conmenchant le 2e. Jour de Januier. 1588—stil D'Angleterre a 1615–

[33]

Page 495.

[Séance] Du Jeudy 30e. Julyet 1612.

Cretophle Montioye ayant esté mis en proces par son gendre Etiene Belot, pour qlqe argent de son mariage qe pretendoit luy deuoir vz: 10. li. dont n' auoit preuue, ne tesmoings. La Court par lettre nous pria de le mettre en Arbitre, ce qui fut fait, dont furent elleus, Abraham Hardret, Gedeon de Laune, pour Monioye: Et Dauid Carperau & Pierre Beauuais pour Belot. tous 2. pere & gendre desbauchéz.

[34]

In eodem, p. 498.

[Séance] Du Jeudy 13. 9-bre. *1612.*

Etienne Belot, redemandant le mereau, dont il s'est absteint de long

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temps a raison de atrouer ses auec son beau pere Cretophle Montioye. On veillera sur luy. & la Cene de 10–bre. &–c.

[35]

In eodem, p. 501.

[Séance] Du Jeudy 6.e· May. *1613.*

Cretophle Montioye, entré, fut censuré de ce q[l] [=qu'il] ne payoit les 20. Nobles a son gendre, ordonné p*ar* les Arbitres, plaida poureté, bien q[e] luy baillera des dettes, p*our* les receuoir. Et d'auoir eu 2. bastards. de sa seruante, a quoy il ne respondit p*er*tinam[t] Aussi Michel Art son Ancien Leuicta de serm[t] faux en la Court spirituelle q[l] n' auoit couché avec elle. Ne se trouua preuue suffisante. Suspendu.

[36]

In eodem, p. 505.

[Séance] Du Jeudi 2 de 7 ber 1613

Cristopher Monjoie ha estes appelles 2, fois et ha dict qu'l ne setient point des n*o*tres p*ar*tant de aduiser en plus grande Compaingnie de sa rebellion

[37]

In eodem, p. 511.

[Séance] Du Dimanche 27.e· Febr. [1614].

Cretophle Montioye, ayant souuent esté exhorté, en p*ar*ticulier & Consistoire d'estre pieux, de sa vie desreglée, & desbordée, & suspendu sans fruict, estant endurci, ayant esté tiré au Magistrat p*our* ses paillardises, & adulteres; N'ayant voulu venir au Consistoire y estant appellé. Ne fréquantant ceste Eglize, suspendu publiquem[t] p*our* ces scandalles. Exhortons de prier Dieu p*our* luy, de luy toucher le coeur, luy donant vraye rescipiscence.

[38-39]

Principal Probate Registry, Somerset House, Prerogative Court of Canterbury, Wills, 28 Fines.

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[38]

[Stephen Belott's Will, 20 July, 1646.]

In the name of God Amen I Stephen Belott of the Bowleing Alley neere Long Lane in the parish of Sepulchers without Newgate London Tyer maker: Being at this present Sick in body but of Sound and perfectt memorie, Lawd and praise be therfore giuen to Almightye God, Calling to minde my yeares and my infirmities, The ffrailtie of this Transitorie life and the vncertentye of the hower of death: doe make an Ordaine this my last will and Testament: And ffirst and Principallie I Commend my Soule into the handes of Almightie God my Creator, Hopeing and Stedfastlie beleeuing that by and through the Meritts of the death and passion and pretious blood shedd vppon the Crosse of Jesus Christ, his onely Sonne and my alone Sauiour and Redeemer, I haue and shall haue full and ffree Remission Pardon and fforgiuenes of all my Sinns and Offences; And to be saued vnto life euerlasting./ My body I Committ to the earth from whence it came to be decentlie buried, in assured Hope of the Resurrection thereof at the Gennerall Judgement day vnto life eternall: And touching such worldly goods and Estate as it hath pleased God of his greatt goodness and mercie to blesse me withall, I doe hereby giue deuise and bequeath the same in manner and forme following: That is to say, Inprimis whereas my late brother Master John Belott, late of the Citty of Harlem in Holland ffrench Schoolemaster deceased, in and by his last will and Testament beareing date the Third day of October, Anno Domini One Thousand six hundred ffortie and Twoe, hath giuen left and bequeathed vnto me the said Stephen Belott, the Summe of Nyne hundred Gilders, Being fowerscore and Tenn poundes English: To be paid after the decease of my sister in lawe Mistris Maijlie van Regemuorter late wife of my said brother Master John Belott deceased, As in and by his said Last will and Testament more at lardge doth and may appeare: And which said Legacie or summe of Nyne Hundred Gilders I haue Constituted authorized and appointed the Elders and deacons of the ffrench Reformed Church in Harlem, for the vse and behoofe

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of me my Executors and Administrators, to Aske Leauy sue for recouer and receaue the same, of and against the heires Executors and Administrators of my said sister in lawe Mistris Maijlie van Reemuorter after her decease As in and by the said writeing of deputation (Relation thereto being had) more at lardge doth and may appeare; And now my will and minde is, And I doe hereby will deuise and dispose the said Legacic of Nyne hundred Gilders being in English fowerscore and Tenn poundes in manner following: And first I giue and bequeath vnto my daughter Ann now the wife of William Haier wyer drawer, the somme of Twentie poundes thereof: Item I giue and bequeath vnto my daughter Jane now the wife of ffrancis Ouering, Glouer; the like Summe of Twentye poundes thereof: Item I giue and bequeath vnto my daughter Easter now the wife of Christopher Baytes, other Twentie poundes thereof: Item I giue and bequeath vnto my loueing wife Thomazine Belott Twentie poundes more thereof; And the other Tenn poundes my will is shalbe for the satisfieing of That Tenn poundes which I borrowed and receaued of my said sister in lawe Mistris Maijlie van Regemuater when I was with her in Harlem :Item I giue and bequeath vnto the poore of the Reformed Church in Harlem the summe of fforty shillings; And my will and desire is, That my loueing wife Thomazine Belott, and my daughter Jane Oueringe shall goe over togeather vnto Harlem in Holland; and there receaue and bring over the said moneys at such time and when as the same shall become due and payable after the decease of my said sister in lawe; And my will and minde is that my said loueing wife and my said three daughters shall be at, beare and allow euery one of them fower and equall parte portion and share towards the charges and expences of their Journey and trauelling ouer vnto Harlem, and for and about the recouering Changeing Transporting and returning and bringing ouer the said monies to deuide the said moneys to and amongst my said wife and my Three daughters equallie for the satisfieing of their said seuerall Legacies (euery one of them beareing and allowing an equall ffowerth parte of all expences and Chardges of fetching and bringing ouer the same as afore-

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said according to the true meaneing of this my last Will and Testament; The rest and residue of all and singuler my Goods, Chattells Houshould stuffe Apparrell Bedding Lynnen Wollen, Brasse Pewter Bonds Bills, writings Specialties debtes Ready monyes and all other my goods and estate whatsoeuer vnbequeathed (My debtes and legacies paid and my ffunerell expences dischardged) I doe fully and freely giue and bequeath vnto my said loueing wife Thomazine Belott whome I make and ordaine my full and sole Executrix of this my last Will and Testament; desireing her to execute and performe the same in and by all things according to my true intent and meaning herein before specified and declared; And I doe hereby Reuoke and disanull all former and other Wills by me at any time heretofore made; And I doe pronounce and declare this and none other to stand and be my last Will and Testament: In Witnes whereof I the said Stephen Belott to this my last Will and Testament (Contained in fower sheets of Paper) haue sett my hand and Seale, The fiue and Twentieth day of July Anno Domini One thousand six hundred ffortie six: And in the twoe and twentieth yeare of the Raigne of our Soueraig Lord King Charles &c

Par moy Etiene Belot.

Sealed and Subscribed by the Testator, and acknowledged Published and declared to stand and be his last Will and Testament in the presence of vs Roger Goude: Richard Gill Scr./

[39]

PROBATUM—fuit Testamentum suprascriptum Apud London coram Mag*is*tro ffrancisco Ringsted Clerico Surrogato dilecti subditi no*str*i Nathanielis Brent Militis legum doctoris Curi*ae* no*str*ae, Prerogatiu*ae* Mag*risti* siue Custodis l*egi*time Constitutj, vicesimo quinto die Mensis ffebruarij Anno Domini iuxta Cursum et Computac*ionem* Anglicane [sic] Mill*es*imo Sexcentesimo quadragesimo sexto, Juramento Thomasinae Belott Relictae dicti defuncti et executricis in huius*modj* Testamento nominatae Cui Comissa fuit Administrac*io* omnium et singulorum bonorum iurium et creditorum eiusdem defuncti de bene et fidel*iter* Administrando eadem Ad Sancta dei Evangelia Jurat*a*./ Ex^{r}

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II

THE WITTER–HEMINGES CASE.

The eight following records from the Court of Requests contribute to a knowledge of Shakespeare's financial relations to the Globe theatre as a shareholder. They supplement and are supplemented by the Osteler–Hemynges case.

The Witter–Heminges case arises out of the marriage of one John Witter (1606) with Anne Phillipps, widow of the actor and Globe share-holder, Augustine Phillipps, who died in 1605. Through Anne's executorship of her first husband's will, it is claimed, she came into possession of the Globe share formerly owned by Augustine Phillipps. Witter, through marriage with her, less than two years later, secured a legal interest in all her possessions, but claims now a separate right to the share in question through assignment of it to him by Anne in July, 1606. For fourteen years after this marriage, until the final decree of the Court of Requests dismissing this case absolutely and forever in 1620, Witter made trouble for the Globe company, only a part of which is related in the present set of documents. The story of his squandering his wife's estate, abandoning her and her children when her property was gone, the friendship of Heminges toward her, her death in poverty, and Hemynges's burial of her at his own charge is a little domestic tragedy not planned for public presentation on the boards of the Globe theatre, throwing out into sharp relief the character of Heminges as a representative member of the company.

The plan of organization and maintenance of the Globe company is here for the first time related, as is also the plan, after the fire of 1613, of rebuilding the Globe, attended by doubts, delay, and heavy expense. Some of the changes in share-ownerships are mentioned, as the purchase of William Kempe's share in 1599 by Shakespeare, Heminges, and Phillipps in equal thirds, the transfer of it at once to an outside party who in turn immediately regranted it to Shakespeare, Heminges, Phillipps, and

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Pope in equal fourths, the sale of a share to Osteler, the granting of a half share by Heminges to Condell gratis, the sale of a share to Nathaniel Field after Shakespeare's death, and the whole complicated history of the share claimed by Witter, with its varying shifts of ownership.

One of the significant items in the Witter-Heminges case concerns the basis of organization of that half of the Globe company in the membership of which Shakespeare is always named first. He and his associates converted their half from a tenancy in common into a joint-tenancy. The nature and significance of this sort of organization and its apparent influence on all succeeding theatrical organizations of the time, accompanied by a summary of the chief data and a story of considerable human interest in its bearing upon Shakespeare and his fellows, is presented in an article in the *Century Magazine,* August, 1910. This central point of joint-tenancy illuminates the bare facts in the history of the shares as told by these and the Osteler-Hemynges records, and explains conditions of organization and management in all the other theatrical companies. The relations of Shakespeare and his associates to each other in building, managing, and rebuilding the Globe theatre, and in maintaining their enterprise throughout with a larger spirit of equity than the strict letter of joint-tenancy would allow, rising above the smoke and fume and smouldering fire of Witter's making, emerge now from the centuries with noble proportions.

Shakespeare's income from his share in the Globe theatre was equal to that of each associate who owned the same amount. Witter in these documents declares that his own income from one share previous to the fire and while he owned one-seventh of one-half (or one-fourteenth of the entire theatre, the same as Shakespeare then owned) was 30 *l.* to 40 *l.* a year. Although Witter is an unconscionable distorter of facts when thereby advantage is to be gained, he has no occasion in this instance either to magnify by false statement or to minify the amount of profit received. Moreover, this annual profit from one share in the Globe agrees with a similar amount of 30 *l.* from a share

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of one-seventh in the Red Bull, as presented in the new documents published in the *Studies,* October, 1909, and with another similar amount of about 33 *l.* to 53 *l.* on one-sixth of the Blackfriars just before Shakespeare's company in 1608 took the lease of that theatre. Other evidence also is available, rendering it now possible to make a first tentative study of Shakespeare's income on the basis of historical facts. The large fancy hitherto exhibited, through which it has been romantically guessed out that Shakespeare's income from his share in the Globe was 500 *l.* to 600 *l.* a year was a pretty fancy, which must now for all time be yielded up, even with pangs of regret to those who have built Shakespearean reputations on a collection of similar romantic inferences that pass current for fact in popular biographies of the Poet.

It is not my present purpose to analyze nor even to suggest lines of analysis of these documents. They will tell various stories to various interpreters according to the information, bent, and analytic power brought to the study of them.

[1–10]

WITTER *vs.* HEMINGES AND CONDELL.

Court of Requests Proceedings, James I, Uncalendared. Case of John Witter vs. John Heminges and Henry Condell. (Recently withdrawn from circulation and now preserved separately.)

[Three large skins, consisting of Bill, 21 × 17; Answer, 26 ×26; and Replication, 26 × 26. Fairly well preserved. Ink generally clear, but in some places partly or wholly gone, leaving its impress in the parchment which can still be read with good light and a strong magnifying glass.]

[1]

BILL.

[*In dorso*] xx° die Aprilis Anno *Regni* Regis Jacobi Angliae ffranciae et Hiberniae xvij° et Scotiae lij^do./

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Vocentur defend*entes* p*er* nuntiu*m* Camer*ae*./
Ar. Parkins

To the king*es* most excellent Maiestie

Most humbly complayninge sheweth vnto yor most excellent Maiestie yor most humb*l*e Subiecte John Witter of Mortlake in the Countie of Surrey gentleman That Whearas Augustine Phillippes of London gentleman deceased was in his lyeffe tyme lawfully possessed for many yeares then in beinge and yet to contynewe of and in a sixte parte of the moytie of the gallories of the playehowse called the Globe in Southwarke in the Countie of Surrey (sithence the death of the said Augustine Phillipps consumed with fier and lately reedified) And of divers gardeins thervnto belonginge and adioyninge by force of a demise or lease to him the said Augustine Phillipps made of all the same by Nicholas Brenn of Mouldsey in the said Countie gentleman who was therof seized in his demeasne as of ffee, And he the same Augustine Phillipps soe beinge thereof possessed in or aboute the moneth of Maie in the third yeare of the raigne of yor Maiestie made his last will and testament in writinge, And thereby did constitute and make his then wyeffe Anne his Executrix of his said last will and testament, and shortly after dyed soe possessed of the said tearme, And sone after the decease of the said Augustine Phillipps his said will or testamente was duely proved before Sr John Bennett Knight then Iudge of the Prerogatyve Courte of the then Archbyshoppe of Canterburie wch was the Competente Ordinarie to whome the same did then app*er*taine and belonge of right accordinge to your Maiesties Ecclesiasticall lawes of yor highnes Realme of England. By virtue whereof and of a devise or guifte in and by the same will and testamente to her gyven and devised, shee the said Anne Phillipps the executrix and relicte of the said Augustine Phillipps into the said sixte parte of the said gallories ground and play howse of the Globe and gardens entered and was thereof possessed accordinglie and did receaue and take the yssues profittes and com*m*odities therof as well and lawfull was for her to doe And shee soe beinge thereof, and of the other goodes and Chattells of her said late deceased husband wch shee

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administred possessed did duringe the tyme of her wyddowehoode that is to saye in or aboute the moneth of Julie in the said third yeare of yor Ma:^{tes} said raigne of this yor Realme of England sufficientlie graunte and assigne over vnto yor said Subiecte all the same tearme therein then to come and vnexpired togeather wth the orriginall lease or graunte thereof vnto her said late deceased husband soe made and graunted by the said Nicholas Brenn as ys aforesaid. To haue and to hould the same vnto yor said Subiecte and his assignes for and duringe all the tearme and tyme therein then to come and vnexpired. By force whereof yor said Subiecte thereinto did enter and was thereof possessed accordingly and receaved the rentes yssues and profyttes thereof accordinglie for fyve yeares vntill nowe of late aboute eleaven yeares last past That yor said Subiecte wantinge money was dryven to morgage the same lease and tearme vnto Iohn Hem*m*ynges of London gent for the some of ffiftie pownd*es* wch yor said Subiecte then of him had and receaved vpon a provisoe or Condicion therein expressed for the repaymente thereof with ffiftie shillinges more for the vse or interest thereof at the end of six monethes then next enseweinge All wch ffiftie twoe pownd*es* and tenn shillinges the said Hem*m*ynges then had and accepted of at the hand*es* of yor said Subiecte at the said lymitted tyme accordinge to the said provisoe or Condicion before mencioned at such tyme as yor subiect was in prison in the Kinges Bench in Southwarke aforesaid. But nowe soe yt is may yt please yor Maiestie That the said orriginall lease last will and testamente and the assignemente and graunte aforesaid beinge by such meanes as ys aforesaid or by some other casuall meanes come to the handes and possession of the said John He*m*mynges and one Henry Coundall gentleman one of his fellowes and familiar Companions beinge both s*er*vantes to yor Maiestie they the said John Hem*m*ynges and Henry Coundall by cullour of haueinge thereof not onelie haue wroungfullie and without any iust tytle aboute fyve yeares last past entered into and vpon the said sixte parte of the said playe howse grounde gallories and gardeins called the Globe, but alsoe did by like wrounge and inivrie ever sithence and yet doe detayne and keepe

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the same And all the rentes yssues and profyttes thereof from yor said Subiecte without any recompence or consideracion to him therefore gyven payed or allowed and haue made and contrived vnto them selves and to dyvers other persons vnto yor said Subiecte vnknowne dyvers and sundrie subtile seacrett and fraudulent estates of purpose to defraude and defeate yor Subiecte thereof. And that he might not knowe whome to sue for the same nor against whome he might recover the premises, All wch is done contrarie to all right equitie and good conscience, And to the vndoeinge of yor said Subiecte his wyeffe and Children vnlesse yor Maiesties accustomed ayde to him be therein as yt is to others in like distressed cases extended. In tender consideracion whereof And for asmuch as the said John Hemmynges and Henry Coundall haue hithervnto denyed and refused and as yet doe denye and refuse to permitt yor said Subiecte quietlie to enioye and possesse the demised premises or yet to redelyver vnto yor said Subiecte the said orriginall lease last will and testamente and the assignemente and graunte before mencioned made by the said Anne, And satisfie your said Subiecte for the meane profittes thereof although they the same John Hemmynges and Henry Coundell and either of them haue byne therevnto often in frendlie and curteous manner required and desired to doe all the same wch they affirme and pretend by theire wordes speeches and Actions they will still soe contynewe theire doeinge of and hould perforce your said Subiecte from and out of the same without any accompte profytte or commoditie thereof to your said Subiecte to be gyven or answered for the same, And for asmuch as the said morgage soe made to the said John Hemmynges and the paymente of the said ffiftie twoe powndes and tenn shillinges vnto him the same John Hemynges by your said Subiecte was in private and seacretlie had and made And scarse any more then them selves that be nowe alyve privie or acquainted therewith, Whoe san testifie the same. And for that also yor said Subiecte doeth not knowe all the certainety of the said last will or testamente orriginall lease and the assignemente thereof, nor the full substance and sure contentes or certaine and true dates thereof nor whether

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the same or any of them be contayned in any Chest Cubbord or truncke locked, or any bagge or boxe sealed or otherwise, And for that alsoe yo[r] said Subiecte verilie hopeth and is *per*swaded that the said John Hem*m*ynges and Henry Coundall beinge to answeare hearvnto in this Courte vpon theire oathes will (As your Subiecte desireth) thereby confesse and acknoweledge all the whole truth for and in the premisses vpon theire oathes in theire answeares hearvnto whervnto they are not compellable at or by the Com*m*on lawes of this Realme, And for asmuch alsoe as yo[r] said Subiecte ys not of abilitie and power to contend in lawe with the said John Hem*m*ynges and Henry Coundall who are of greate lyveinge wealth and power and haue many more mightie and greate frendes then yo[r] said Subiecte whereby he ys and shalbe destitute of all helpe remedy and hope to be ayded and releeved by the ordinary and strickte course or rigor of the Com*m*on lawes and ordinary proceedinges of this Realme or ellswheare then by your Maiestie or your Courte of Requestes and Counsell of Whitehall at Westminster vsuall[y] extended to helpe and succour them in theis and the like Cases distressed or oppressed. May it please your highnes to graunte vnto your said Subiecte your most gracious wrytt of privie Seale to be directed to the said John Hem*m*ynges and Henry Coundall and to either of them Com*m*aundinge them and either of them at a certaine day and vnder a certaine payne theirein to be lym*m*itted to be and p*er*sonollie to appeare before yo[r] Maistie and Counsell in the said honorable Courte of Requestes at Whitehall in Westminster then and theire to answeare vnto the premisses, And further to stand to and abyde such further order and direction therein As to your highnes said Counsell of the same Courte shalbe therein taken and thought fytt to agree with equitie and good conscience. And your said Subiecte shall accordinge to his duety daylie pray vnto god for the longe pres*er*vac*i*on contynewance and stabilitie of your Maisties most happie raigne.

Raphe Wilbraham

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[2]

Appearance Book, 16 and 17 James I.

[This book was found by me among the uncalendared Proceedings of the Court of Requests, and handed over to the proper official who has placed it among the "Miscellaneous Books" of this court.]

Liber Emptae *per* Petrum Langley in
Termino pasche xvj^to^ Jacobj Regis &c

23 April, 17 James I.

Johannes Heminges et Henricus Cundall gen*erosi* personal*iter* comp*aruer*unt cor*am* con*silio* p*er* mandat*um* nostrum Camer*ae* ad sectam Joh*ann*is Witter gen*erosi*. postea viz 28° die mensis instan*tis* admissi sunt p*er* Lee: con*silio* mag*istri* Kele

[3]

ANSWER.

xxviij°: die Aprilis Anno R*egni* R*egis* Jacobi
Angli*ae* ffranci*ae* et Hiberni*ae* xvij°. et Scoti*ae*. lij^do^./

The ioynt and seuerall answers of John Hemings and Henry Condell gentlemen def^tes^ to the bill of Complaint of John Witter gentleman Complaynant.

The said Def^tes^ and either of them saueing to themselues and either of them nowe and at all times hereafter all advantages of excepc*i*on to the incertentie & insufficiencie of the said bill of comp*lain*t for answer to so many of the matt^rs^ therein conteyned as any way concerne them the said def^tes^ or is materiall for them or eith^r^ of them to answer vnto Do say & eith^r^ of them for himself saith That he thincketh it to be true that the said Augustine Phillipps in the said bill of Comp*lain*t named was in his life time lawfully possessed of such terme of yeeres of & in a fiveth p*ar*te of the moitie of the said galleryes of the said Playhowse Called the globe in the said bill menc*i*oned and of divers gardens therevnto belonging & adioyning And that the said Nicholas Brend in the

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said bill named was thereof seised in his demesne as of fee as in the said bill is alledged But the said def^tes^ say that they do not thincke that the said Augustine Phillips was so possessed of the said terme of yeeres by force of a demise or lease to him the said Augustine Phillipps made of all the same by the said Nicholas Brend ymediatly/ ffor the said gardens and ground*es* wherevpon the said Playhowse & galleryes were afterward*es* builded were demised & letten by the said Nicholas Brend by his Jnd*entur*e of lease trip*ar*tite bearing date in or about the xxj^th^ day of ffebruary in the xlj^th^ yeere of the raigne of the late Queene Elizabeth vnto Cuthbert Burbadge Richard Burbadge Willi*a*m Shakespeare the said Augustine Phillipps Thomas Pope the said John Hemin*ges* one of the said def^tes^ and Willi*a*m Kempe To have and to hould the one moitie of the said garden plott*es* and ground to the said Cuthb*er*t Burbadge and Richard Burbadge their executo^rs^ admin*i*strato^rs^ & ass*ign*es from the ffeast or the birth of our Lord god Last past before the date of the said Jnd*entur*e vnto thend & terme of xxxj yeeres from thence next ensuing for the yeerely rent of seaven pound*es* & five shilling*es* And to haue & to hould thoth^r^ moitie of the said garden plott*es* & ground*es* vnto the said Willi*a*m Shakespeare Augustine Phillipps Thomas Pope the said John Hemin*ges* one of the said def^tes^ & Willi*a*m Kempe their executo^rs^ admi*ni*str*ators* & ass*ign*es from the said ffeast of the Birth of our Lord god then last past before the date of the said Jnd*entur*e vnto the said full end & terme of xxxj yeeres from thence next ensuing for the like yeerely rent of seaven pound*es* & five shilling*es*. Which said Wm Shakespeare Augustine Phillipps Thomas Pope John Hemin*ges* & Willi*a*m Kempe did shortlie after graunte & assigne all the said Moitie of & in the said gardens & ground*es* vnto Willi*a*m Levison and Thomas Savage who re-graunted & reassigned to eu*er*ye of them seu*er*ally a fift p*ar*te of the said Moitie of the said gardens & ground*es*, Vpon wch p*r*em-isses or some p*ar*te thereof there was shortly after built the said then Playhowse. So as the said Augustine Phillipps had a fiveth parte of the moitie of the said gardens & ground*es* & after the said Playhowse was built he had a fiveth p*ar*te of the said galleryes

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of the said Playhowse in ioynt tenancie wth the said William Shakespeare Thomas Pope the said John Heminges & Wm Kempe & as tenant in Common during the said terme of yeeres demised by the said Nicholas Brend as aforesaid as the said def^tes^ do take it But the said def^tes^ do say that about the time of the building of the said Playhowse & galleryes or shortlie after a third parte of the fiveth parte of the said Moitie of the said Playhowse galleryes gardens & ground wch was the fiveth parte of the said William Kempe did come vnto the said Augustine Phillipps by a graunt or assignem^t^ of the said fiveth parte made by the said Wm Kempe to the said Wm Shakespeare the said John Heminges one of the said def^tes^ and the said Augustine Phillipps./ W^ch^ said Last mencioned fiveth parte did shortlie after come to Thomas Cressey by the graunte & assignem^t^ of the said Wm Shakespeare the said John Heminges and Augustine Phillipps wch said Cressey did shortlie after regraunte and reassigne the said fiveth parte to the said William Shakespeare John Heminges Augustine Phillipps & Thomas Pope as the said def^tes^ do take it. So as the said Augustine Phillipps then had a fiveth parte and the fourth parte of another fiveth parte of the said moitie of the said playhowse galleryes gardens and grounde*s* as the said def^tes^ do verily beleeve for & during the same terme of yeeres/ And the said def^t^ John Heminges doth also say that he thincketh it to be true that the said Augustine Phillipps being so of one fiveth parte and of the fourth parte of another fiveth parte of the said moitie so possessed in or about the time in the said bill mencioned made his Last will & testam^t^ in writing & thereby made his then wife Anne his executrix of his said Last will & testam^t^ & shortlie after died so possessed of the said terme of & in the said parte of the said moitie as is aforesaid And that shortly after his decease his said will was proved in the Prerogative Court of Canterbury as in the said bill is alledged. And the said def^t^ John Heminges doth say that he likewise thincketh it to be true that by vertue of her the said Annes being Executrix of the said will shee into the said partes of the moitie of the said galleryes ground & playhowse late of the said Augustine Phillipps as aforesaid did enter & was

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thereof possessed accordingly and did receive & take the yssues proffitt*es* and com*m*odities thereof But whether her said entrie into the said p*ar*te or into any p*ar*te thereof was by virtue of a divise or guift in & by the said will & testam^{t} to her geven & devised or not this def^{t} saith he knoweth not And yet he thincketh it to be true that the said testato^{r} Augustine Phillipps in & by his said Last will & testament did geve & bequeath one third p*ar*te of all his good*es* & chattells to the said Anne But this def^{t} saith that he doth not thinck that the said Anne made her elecc*i*on to haue a third p*ar*te of the p*ar*tes Late of the said Augustine her said husband of the said moitie of the said galleryes gardens & ground as a legacie geven vnto her by the said will And this def^{t} John Heming*es* doth also say that although the said testato^{r} Augustine Phillipps in & by his said Last will and testam^{t} did ordeyne & make the said Anne his wife Executrix of his said Last will & testament yet the same was not absolutely but onley with proviso or vpon condic*i*on in the said will expressed that if the said Anne his wife should at any time marrie after his decease That then & from thenceforth shee should cease to be any more or longer Executrix of his said Last will or any wayes intermedle with the same And that then and from thenceforth this def^{t} John Heming*es* the said Richard Burbadge Willi*a*m Slye & Tymothie Whitehorn should be fully & wholie his executo^{rs} of his said Last will and testament as though the same Anne had never byn named As by the same last will and testament ready to be shewed to this honorable courte (to which said will this said def^{t} for the more certentie thereof doth referre himself) more playnely appeareth. And this def^{t} John Heming*es* further saith that the said Compl*ainan*t in or about the Moneth of November in the fourth Yeere of the King*es* Ma^{tes} raigne of England Did come to this def^{t}, and making shewe and affirming that the said Anne and himself then stood in greate nede of money did make offer to p*ro*cure the said Anne to mortgage her said terme of and in the said fiveth p*ar*te of the said Playhowse galleryes gardens and ground*es* wch was so regraunted to the said Augustine Phillipps by the said Levison and Savage as is aforesaid vnto this

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def^{t} for the somme of fiftie pounde*s* or thereaboute*s* wherewith to relieve their wante*s* and would haue had the said Anne by herself to have made the said Mortgage to this def^{t}. But this def^{t} then suspecting that the said Compl*ainan*t and Anne having then by a good space byne in treatie of a mariage betwene them might then be secretlie marryed and so her assuraunce alone nothing worth and nothing at all then doubting that the said Anne had assigned over the said terme of yeeres of & in the said fiveth p*ar*te of the said moitie to the said Compl*ainan*t this def^{t} required the said Compl*ainan*t to ioyne in the said assuraunce of the said terme of yeeres of the said fiveth p*ar*te of the said moitie in Mortgage for his said money wch he the said compl*ainan*t yeelded vnto And therevpon both the said compl*ainan*t & the said Anne then confessing themselues to be maried ioyned in the said Mortgage to this def^{t} and he paid vnto them the said some of 50^{li} wch together with 50^{s} for consideracion for the forbearaunce thereof this def^{t} Confesseth was repaid vnto him on the day lymmitted in & by the said dede of assuraunce in mortgage for the repayment thereof. But this defend^{t} did not knowe or thincke that the said Anne had assigned or settover the said terme of yeeres & the said interest of & in the said fiveth p*ar*te of the said moitie vnto the said compl*ainan*t wch if shee had donne this def^{t} thincketh he had byne meerely deceived & defrauded of his said 50^{li} if he would haue lent the same wthout the said Compl*ainante*s ioyning wth the said Anne in the said Mortgage But if any such assignement of the said terme of yeeres was made by the said Anne vnto the said Compl*ainan*t before the said compl*ainan*t & the said Anne intermaried the same was done contrary to the said testato^{rs} meaning in & by his said Last will and to the trust by him reposed in the said Anne thereby & wth purpose to take away & avoid theffect of the said condicion made by the said testato^{r} in his said will wch was intended for the good & p*re*ferment of his children Which Course of dealing this def^{t} thincketh deserveth no favo^{r} or relief in any Court of equitie And this def^{t} hopeth to prove that the said Anne did not make the said supposed assignem^{t} of the said terme of yeeres & interest of & in the said fiveth p*ar*te of the said

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moitie to the said Compl*ainan*t before their intermariage for that after their said intermariage the said compl*ainan*t claymed the same p*ar*te onely in the right of the said Anne his wife as Executrix of the said Augustine Phillipps as will appeare by divers writing*es* & otherwise And this def^{t} verely thincketh that if the said supposed assignem^{t} be p*ro*duced & brought to light that it will not abide the touch in the triall thereof Or if the said Anne did make the said assignem^{t} vnto the said Compl*ainan*t before their intermariage this def^{t} hopeth to prove that it was and is meerely void in Lawe And this def^{t} saith that after the said intermariage of the said Compl*ainan*t wth the said Anne he the said compl*ainan*t did ioyne in the graunting of two sixth p*ar*tes of the said Moitie of & in the said Playhowse galleryes gardens and ground*es* wth this def^{t} & the rest then interessed therein vnto Willi*a*m Slye and the said other def^{t} Henry Condell/ And this def^{t} doth deny that he or to his knowledge the said other def^{t} Henry Condell hath the said assignement or graunt so supposed to be made by the said Anne to the said Compl*ainan*t. But Confesseth that he hath the said last will and testam^{t} of the said Augustine Phillipps and the said dede whereby the said Augustine Phillipps had onely a fiveth p*ar*te of the said Moitie of the said Playhowse galleryes gardens & ground during the said terme of yeeres and that at & vpon the earnest solicitac*i*on & intreatie of the said Anne before the said repaym^{t} of the said fiftie pound*es* vnto this def^{t} shee then in vrgent manner affirming vnto him that the deliu*er*ye thereof vnto the said Compl*ainan*t would be her vtter vndoing he this def^{t} did forbeare to deliver the same vnto the said Compl*ainan*t but kept the same And this def^{t} hath also in his hand*es* and Custody the said originall lease so made by the said Nicholas Brend to him & oth^{rs} as is aforesaid and keepeth the same to the vse of himself & the rest wch haue any interest therevnto by & wth their Consent*es* And this def^{t} further saith that by meanes that the said Compl*ainan*t & the said Anne were intermaryed whereby the said Condic*i*on in the said will of the said Augustine Phillipps was broken and especially to keepe the Compl*ainan*t from receaving or recovering of the some of 300^{ll} w^{ch}

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did then remaine in the hand*es* of Sir Eusebius Jsam Knight least he should spend the same as he had before lavishly and riotuously spent wasted & consumed almost all the rest of the said good*es* & chattells wch were of the said Augustine Phillipps and as he after spent 80^{li} of the said 300^{li} wch he gott out of this def^{tes} hand*es* after that he had received the same 300^{li} of the said Sr Eusebius and wth the consent and intreatie of the said Anne the admi*ni*stra*cion* of the good*es* and chattells of the said Augustine Phillipps in or about the Moneth of May in the fiveth yeere of his Ma^{tes} said raigne was Com*m*itted to this def^{t} in the p*re*rogative Court of Canterbury as Executo^{r} of the said Last will & testament of the said Augustine Phillipps By virtue whereof he this def^{t} did enter into the said fiveth p*ar*te of the said moitie of the said Playhowse galleryes gardens and ground*es* and did take the rent*es* yssues and proffitt*es* thereof as well & lawfull it was as he hopeth for him to doe After which said admi*ni*stracion so taken by this def^{t} he paid a legacie of five pound*es* to or for the poore of Mortlack in the County of Surrey wch the said Anne & the said Compl*ainan*t had left vnpaid by all the time wherein shee was executrix as aforesaid and he this def^{t} is to pay more legacyes to oth^{rs} when the same shalbe due & payable by the same last will and this def^{t} in Charitie also to relieue the said Compl*ainan*t & the said Anne his wife & her children did from time to time divers & many times deliver sometimes vnto the said Compl*ainan*t & sometimes to the said Anne divers som*m*es of money amounting in the whole to a greate some vntill about the Moneth of ffebruary in the Eight yeere of his Ma^{tes} said raigne about wch time the said compl*ainan*t & Anne his wife by their dede pole bearing date the tenth day of ffebruary in the said Eight yeere of his Ma^{tes} said raigne (this def^{t} then being in possession of the said fiveth p*ar*te of the said moitie of the said playhowse galleryes ground*es* & gardens) did remise & release vnto this def^{t} all & al manner of acc*i*ons debt*es* bills bond*es* accompt*es* matt^{rs} & demaund*es* whatsoeu*er* as by the said dede pole ready to be shewed to this ho^{ble} Courte may appeare By wch said release this def^{t} hopeth that the said Compl*ainan*t is barred both in lawe & equitie

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to sue for or demaund the said fiveth p*ar*te of the said moitie of the said playhowse galleryes ground or gardens & Contrary or against wch said Compl*ainantes* owne dede of release this def^{t} hopeth that this ho^{ble} Courte will not p*er*mitt the said Compl*ainant* to sue this def^{t} for the said fiveth p*ar*te or any p*ar*te of the said moitie of the said playhowse in this hob^{le} Courte And this def^{t} furth^{r} saith that shortlie after the makeing of the said release by the said Compl*ainant* & his wife to this def^{t} the said Compl*ainant* & his said wife did take a lease of this def^{t} by Jnd*entur*e bearing date the xiiijth day of the said Moneth of february wch was but foure dayes after the date of the said release, of a sixth p*ar*te of the said moitie of the said playhowse garden plott*es* and p*rem*isse*s* for the terme of Eighteene yeeres from the birth of our Lord god then last past yelding & paying therefore yeerely during the said terme vnto this def^{t} his exec*utors* admin*istrators* & assig*nes* xxiiij^{s}ij^{d} of Lawfull money of England at the ffeast*es* of thanunciac*i*on of the blessed virgin Mary the Nativity of St John Baptist St Michael Tharchangell & the birth of our Lord god or wthin tenne dayes after eu*er*ye of the same ffeast dayes by even porc*i*ons Provided alwayes that if it should happen the said yeerely rent of xxiiij^{s}ij^{d} to be behinde vnpaid in p*ar*te or in all by the said space of tenne dayes next over or after any of the ffeast dayes of paym^{t} thereof aforesaid in wch the same ought to be paid being lawfully demaunded Or if the said Compl*ainant* his exec*utors* ad*ministrator*s or ass*ignes* should not wthin one yeere then next Comeing pay and discharge the said legacie of five pound*es* geven & bequeathed by the last will & testam^{t} aforesaid vnto the poore of the p*ar*ish of Mortlack or should not wthin the space of one whole yeere then next Comeing Cause & p*ro*cure a sufficient acquittaunce or dischardge vnder the hand*es* & seales of the p*ar*son or Curat and Churchwardens of the said p*ar*ish to be geven & deliu*er*ed to this def^{t} his exec*utors* ad*ministrator*s or ass*ignes* for his & their dischardge of & for the said legacie of five pound*es* wth divers oth^{r} p*ar*tes of the said Condic*i*on hereafter to be p*er*formed by the said Compl*ainant* his exec*utors* admin*istrators* & ass*ignes* That then the demise & graunte aforesaid of the *pre*misses should

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be void & of none effect. Jn wch said Jnd*entu*re of lease it is recited and expressed that the said sixth p*ar*te of the said Moitie of the said Playhowse garden plott*es* & p*re*misse*s* was then Lawfully Come to the hand*es* & possession of this def^t^ by his being adm*ini*strato^r^ of the good*es* chattells right*es* & debt*es* aforesaid of the said Augustine Phillipps, And that this def^t^ in consideraci*on* that the said Compl*ainan*t should pay & dischardge the said Legacie of five pound*es* and two oth^r^ legacies of tenne pound*es* a peece menci*on*ed in the said Condici*on* did make the said demise & lease As by the Counterp*ar*te of the said Jnd*entu*re of lease ready to be shewed to this ho^ble^ Courte (whereto this def^t^ refer-reth himself) more playnely appeareth/. whereby this def^t^ thincketh that it manifestly appeareth that the said Compl*ainan*t then claymed not the said sixth p*ar*te of the said Moitie by the said supposed assignem^t^ by him p*re*tended to be thereof made vnto him by the said Anne & that this def^t^ was Lawfully interessed in the said sixth p*ar*te as adm*ini*strato^r^ when the said release was so made vnto him or by the said release when the said def^t^ made the said Lease vnto the said Compl*ainan*t & his said wife of the said sixth p*ar*te of the said moitie of the said playhowse gardens & ground And this def^t^ furth^r^ saith that about the said terme of five yeeres Last past menci*on*ed in the said bill of Compl*ain*t or about Six Monethes before the said Playhowse and galleryes were casually burnt downe & consumed wth fier/. Shortlie after wch this def^t^ and his p*ar*tners in the said Playhowse resolued to reedifie the same & the rath^r^ because they were by Coven*an*te on their p*ar*te in the said originall lease conteyned to mainteyne & repaire all such building*es* as should be built or erected vpon the said gardens or ground during the said terme as by the said originall lease may appeare And therevpon this def^t^ did write his L*ett*re to the said Compl*ainan*t signifieing the same vnto him & therein required him to come & bring or send 50^li^ or 60^li^ by a day therein menci*on*ed for & towards the reedifieing of a howse in regard of his the said Compl*ainantes* p*ar*te of the said ground wch this def^t^ had so demised vnto him & his said wife by the said lease if he would adventure so much (he the said Compl*ainan*t

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having latly before ioyned with the said deftes & the rest then interessed in the said moitie of the said playhowse gardens & ground to William Ostler of a seaventh parte of the said moitie) But the said Complainant neither brought or sent any money towardes the reedifieing of the said Playhowse Nor did this deft ever receive any answer by or from him the said Complainant of his this deftes said Lettre which when this deft.perceived although the said Complainant had broken the said Condicion of the said lease by not paying the said legacie of five poundes & by not procuring of the said acquittaunce or dischardge from the said parson or Curatt & Churchwardens of Mortlack aforesaid yet he this deft demaunded the two next quartrs rentes reserved vpon the said lease on the severall tenth dayes after the said two next ffeastes of paymt & there Continuing his said demaundes vntill the sunne was sett on eithr of the said dayes But neithr the said Complainant nor any for him paid or came to pay eithr of the said quartrs rentes on eithr of the said dayes And therevpon this deft did enter into the said parte so demised as aforesaid for the said Condicion broken & because he found that the reedifieing of the said playhowse would be a verie greate charge & doubted what benefitt would arise thereby & for that the said originall Lease had then but a fewe yeeres to come he this deft did geve away his said terme of yeeres & interest of & in the one Moitie of the said parte of the said Moitie of the said garden plottes & ground to the said othr deft Henry Condell gratis The reedifieing of wch parte hath sithence Cost the said deftes about the somme of Cxxli, and yet one other sixth parte of the said moitie of the said playhowse galleryes gardens & ground before the said playhowse was burned & Consumed with fier was absolutely sould for lesse money then the half of the said charges of the said deftes in the newe building thereof when there were more yeeres to come therein then there were at the time of the said burning thereof & yet the said Complainant was in Lawe chardgeable wth the reedifieing of the said parte of the said moitie by the said lease, And this deft further saith that sithence the said release & lease made as is aforesaid he hath also from time to time divers & manie times in

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Charitie & to relieve the said Compl*ainan*t his said wife & her children deliu*er*ed sometimes vnto the said Compl*ainan*t himself, sometimes to his said wife & sometimes to oth^{rs} for them divers oth^{r} som*m*es of money amounting to a further greate some of money vntill about the said time of the burning of the said playhowse & the said Compl*ainan*t divers yeeres before the said Anne dyed did suffer her to make shift for herself to live & at her death this def^{t} out of charitie was at the charges of the buryeing of her./ Without that that the said Nicholas Brend made a demise or lease of the said sixth p*ar*te of the said moitie to the said Augustine Phillipps or of any p*ar*te oth^{r}wise then as is aforesaid or that the said Anne to this def^{tes} knowledge did or could graunte or assigne the said supposed originall lease to the said Compl*ainan*t or that the said Augustine Phillipps died possessed of a sixth p*ar*te onely of the said playhowse gardens & ground*es* as in the said bill of Compl*ain*t is p*re*tended/ And the said other def^{t} Henry Condell for himself saith that the said other def^{t} John Heming*es* a litle before the reedifieing of the said newe playhowse did freely geve & assure vnto him one moitie of the said p*ar*te of the said garden plott*es* & ground*es* but denyeth that he or to his knowledge the said oth^{r} def^{t} John Heming*es* hath the said assignement or graunt so supposed to be made by the said Anne to the said Compl*ainan*t or that he this def^{t} hath the said Last will & testam^{t} of the said Augustine Phillipps or the said dede whereby the said Augustine had onely a sixth p*ar*te of the said moitie of the said playhowse galleryes gardens & ground during the said terme of yeeres or the said originall lease made by the said Brend but he thincketh that the said oth^{r} def^{t} hath the same will dede & originall lease. And both the said def^{tes} Do say & confesse that a litle space before the reedifieing of the said playhowse they the said def^{tes} did enter into the said moitie of the said p*ar*te of the said moity of the said Garden plotts and grounds which was of the said Augustine Phillipps and doe yet keepe the same and from and after the reedifying of the said playhowse did and yet doe receiue and take the rents and proffitts thereof and doe keepe the same from the said Compl*ainan*t as well & Lawfull it was & is for them as they

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hope to doe, Without that that the said def^tes haue made or contrived to themselues or to any oth^r person or persons any estate or estates of the said parte other then is aboue mencioned & one Eight parte of the said moitie of the said playhowse galleryes gardens & grounde*s* graunted by the said def^tes & oth^r their partners in the said moitie to Nathan ffield & one oth^r estate made to John Atkins gent in trust for the said def^t John Heminge*s* of two litle parcells of the said ground by the said def^t John Heminge*s* & the rest of the partners in the said Playhowse & premisse*s* vpon parte whereof the said John Heminge*s* hath built a howse And without that that the said def^tes haue made or contrived to themselues or to any oth^r person or persons any secrett subtill or fraudulent estates of purpose to defraud or defeate the said Complainant or oth^rwise as in & by the said bill of Complaint is very falsely & slaunderously suggested And w^thout that that any other matter or thing in the said bill of Complaint conteyned materiall or effectuall for the said def^tes or eith^r of them to answer vnto & herein & hereby not sufficiently answered vnto confessed & avoided denyed or traversed to these defend^tes knowledges is true All wch matters the said def^tes & eith^r of them are ready to averre & prove as this Court shall award & do pray to be dismissed forth of the same wth eith^r of their reasonable coste*s* & charges in this behalf most wrongfully susteyned/

Seb: Kele:

[4]

REPLICATION.

x° die Maij Anno R*egni* Regis Jacobi
Angliae ffranc*iae* et Hib*erniae* xvij° et Scotiae lij^do/

The Replicacion of John Wytter gentleman Complaynant to the ioynt and seaverall Answeares of John Hemmynges and Henry Condall gentlemen Defend^tes.

The said Complayn^t haueinge to him nowe and at all tymes hearafter saued and allowed the benefitt of all exceptions and other advantages whatsoever to the incertaintie insufficiencie and im-

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perfections of the said Answeares of the same defend[tes] for Replicacion therevnto sayeth That his said Bill of Complainte against the same defend[tes] and either of them exhibited in this honorable Courte and all and everie the allegations matters thinges and clauses therein contayned are good lawfull perfecte and sufficient in the lawe in such sorte manner and forme as in the sayde bill the same are and everie of them is sett forth declared and expressed. And that the matters therein contayned are not nor anie of them ys to be iustlie avoyded dischardged or answered in this Courte by the said defend[tes] or either of them but are grounded vpon good and iust cause of suite as by the contentes thereof and better shall hearafter appeare herein to this honorable Courte. And further he the same Complaynante sayeth That the Answeares of the said defend[tes] are and either of them ys vncertaine imperfecte and insufficiente in the lawe to be replyed vnto, and likewise is most false and vntrue, And that the same Answeares are replenished and stuffed full of idle imperfecte and frivolous matters incerted onelie to put the Complaynante to needelesse and vnnecessarie chardges for the Copie, And all the same he the said Complaynt will averr and prove as this honorable Courte shard [sic] award. And the said Complaynante for further Replicacion sayeth and will aver and prove That the same defend[tes] or either of them haue not nor of late yeares had anie manner of right title or interest in or to the parte of the gallories of the play howse called the Globe, and of the [said] gardens and premises in the bill mencioned by the said Complaynant claymed by reason whereof the yssues comodities and profitts thereof should haue byne and yet ought to be still answered and payed to the said Complaynante by the said defend[tes] whoe haue vniustlie and without anie lawfull cause [or] good collour of tytle receaued and taken the same of theire owne meere wronge and apparante iniurie, and converte the same vndulie and wrongfullie to theire owne proper vse and behoffe beinge the principall and cheiffe staie and meanes of maynetenance for the said Complaynante and his wyeffe and Children. And for asmuch as it as yt evidentlie appeareth by their answeares

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of the same defend^{tes}, That the said Complaynante hath good interest and tytle to asmuch at the least (yf not more) as in the said Bill he doeth demaund and clayme wch was the parte of Augustine Phillippes deceased in the said bill named vnto him demised expresselie and by name amongest the rest by the said Nicholas Brend by his Jndenture trip*ar*tite wch came vnto his said wyeffe lawfullie after his decease and from her likewise vnto the said Complaynante by her graunte and assignement thereof vnto him wch is not in any sorte answered or avoyded by the answeares of the said defend^{tes} or of either of them the said Complaynante doeth demaund the iudgemente and order of this honorable Courte for the same parte of their first moytie in the said Answeares menc*i*oned wherevnto they the said defend^{tes} neither doe nor can make anie good collour or pretence of lawfull right or tytle in lawe. And as vnto another parte by this Complaynante claymed in the other moytie of all the said premises wch the said defend^{tes} in like manner doe confesse to haue byne first the said Phillippes and secondlie the said Complaynant*es* wyves and thirdly was this Complaynant*es* owne afterward*es*, The said Complayn^{t} sayeth and will averr and prove That he should and ought to haue the same alsoe both in lawe and equitie for he the said Complaynant at the tyme of the makeinge of the said supposed release and longe after had and enioyed the same his said parte of the said other or late^{r} moytie of the premises without anie manner of lett disturbance denyall or claime of the said defend^{tes} or either of them or of anie other p*er*son or p*er*sons whatsoever. And the said defend^{t} Hem*m*ynges did after the tyme of the makeinge of the said supposed release accompte with the said Complaynante for dyvers yeares togeather for his parte of the profittes thereof, [and] did alsoe satisfie and pay him the same of right and duetie and not as he seemeth nowe falsely to pretend and meane by his said answeare of courtesie benevolence or gifte. And the said Complaynante alsoe sayeth and will averr and prove that the said Release neither did nor could dischardge nor alinate from him his said parte nor extinguishe or avoyde his said interest or tytle therein or to anie p*ar*cell of

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the premises by anie manner of meanes, nor yet hath the same Release sufficiente wordes therein for that purpose to bynde barr or tye this defend[t] in lawe. And yf there weare sufficiente wordes therein by lawe to barr the said Complaynante therein (as theire are not) yet he ought not nor should be bound or barred thereby in equitie or iustice for that there was not any valuable or sufficiente consideracion or any cause at all gyven to the said Complayn[t] or meaninge wherefore the same should passe or be transferred to the said defend[t] Hemmynges nor yet any word touchinge or concerninge the same. whereby the conscience and charitie of the said defend[t] Hemmynges by him soe much amplified and sett out in and by his said Answeare may truelie appeare whoe would carrie and drawe awaye from the said Complaynante soe much yearely revenewe and profitt whervpon he should alsoe lyve) for nothinge at all. And to satisfie this honorable Courte fullie for the matter of the Complaynant*es* release he further sayeth That theire was suite and controuersie at the tyme of the makeinge of the Release supposed to be made by the Complaynant) and before betwene him and the said defend[t] Hemmynges in an Action of trespasse vpon the Case for wordes alledged to be spoken by the said Complaynante against the said defend[t] Hemmynges to his sceandall or damage, to end and determyne w[ch] Action or suite the Release had or gotten from the said Complaynante was onelie made and obtayned and to noe other end or purpose. And that it may plainely appeare to this to this honorable Courte theire was not anie intencion or meaneinge by such Release as this Complaynant made to the said defend[t] Hemmynge*s* to take away from him or to barr him of any interest right or tytle he had or did clayme or pretend to haue vnto the demised premises or any parte thereof the said Complaynante sayeth that the same is manifest and cleare aswell by the same defend[tes] Answeare as by his lease to the said Complaynante made as alsoe by the letter and offer therein to him sent by the same defend[t] in the said Answeare mencioned and by his payment and satisfaction for the said Complaynant*es* parte and porcion of the profittes and commodities of the demised premises had made

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and answered vnto him longe after the tyme of the makeinge of the said supposed Release. And as vnto the entrie and tytle of the said Anne the Executrix into the same premises the lawe doeth expresse and sett downe howe and in what manner and forme shee should and ought to haue the same parte wch was to her devised and bequeathed if theire weare noe speciall and expresse kind of declaracion howe and in what sorte shee claymed the same when shee entered therein and claymed the same at the tyme of her enterie, wch will and must fall out to be verie cleare both in lawe and equitie on the said Complaynant*es* behalfe. And yet further to avoyde and take awaye the doubte and scrupull wch the said defend^{t} maketh against her and the said Complaynante therein he sayeth that the Condicion or provisoe in the said will and in the said Answeare rehearsed whervpon the said defend^{t} doeth incist ys not good nor availeble in our lawes nor yet in the Ecclesiasticall lawes of this Realme, nor in the imperiall or Romane Civill lawes whereby noe woman is to be bound or tyed from lawfull marriadge nor to lose or forfaite any executorshipp legacie or other matter or thinge to her devised bequeathed gyven or appointed as this case ys, for or by reason of mariadge. And yet yf the lawe weare otherwise and the said provisoe or Condicion good and of force in the lawe yet as this case ys) it cannot bynd or tye the said Complaynante or his right tytle or interest aforesaid nor yet benyfyt or helpe the said defend^{t} for asmuch as shee the said Anne the Executrix had first lawfullie and duelie proved the said will of her said former husband Phillipps and tooke vpon her the execution thereof whilest shee was his wydowe, and did alsoe afterward*es* and before her intermariadge with the Complaynante assigne and graunte the same vnto the said Complaynante (as shee well and lawfully might doe) before the said Condicion was broken and before the said defend^{t} Hem*mynges* any thinge had or could haue or clayme therein. And alsoe before he had the Executorshipp by him nowe claymed or anythinge to doe or intermedle for touchinge or concerninge the premises or executorshipp aforesaid. Whereby when and after the same lease or parte of the said Anne Phillipps was duelie and

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lawfully to the said Complaynante graunted or assigned by her the said Anne whilest shee was lawfull and sole executrix of the said testamente, the said defend[t] Hem*m*ynges could not afterwar*d*es drawe backe or regaine the same nor yet p*rei*udice the said Complaynant therein nor clayme the same by any good tytle or other meanes, nor yet was he or could he be any lawfull executor of the same will after shee had proved and accepted of the same neither could or might shee afterwardes when shee was maried relinquish the same and yeild it vpp vnto the said defend[t] Hem*m*ynges w[th]out the compl[tes] concent or that the same administration of the said deff[t] could be or was lawfullie com*m*itted to the said defend[t] Hem*m*yng*es* of the said goodes and Chattells of the said Anne Phillippes as his executor w[ch] if it weare not soe yet the said defend[t] Hem*m*yng*es* doeth by his said answeare make the matter cleare and plaine against himself for the said Complayn[t] in his expressinge and recitall of the said provisoe or Condic*i*on in the said will to be that if the said Anne should at any tyme marry after his decease that then and from thenceforth shee should cease to be any more or longer executrix of his said last will or any wayes intermedle with the same. And that then and from thenceforth the said defend[t] Hem*m*yng*es* and the others therein nominated should be fullie and whollie his executors. Soe as it is very evidente and certaine that the full and whole power and authoritie rested in her solie all the tyme of her wyddowehoode at the least, and that duringe all the same time there could be none other executor nor any meanes or good coullor to alter voide or crosse her executorshipp graunte or assignement or any other matter or acte shee did as executrix duringe all the time of her wydowehoode w[ch] alsoe should and ought to contynewe and remayne good and effectuall after her intermarriadge with the said Complayn[t] beinge formerlie well and duelie made or executed. And for asmuch as the said defend[t] Hem*m*ynges confesseth the haueinge in his hand*e*s and custodie aswell of the said release and the said deede whereby the said Augustine Phillipps had a fifth part of the moitie of the said play howse galleries gardens and ground*e*s duringe the said tearme of yeares yet induringe,

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And the said last will and testament of the said Augustin Phillippes As alsoe the said orriginall lease to him and others made by the said Nicholas Brend wch lease the same defend^t^ confesseth he keepeth to the vse of himself and the rest wch haue any interest therevnto (whereof the said Complayn^t^ is one whoe neither did nor yet doeth consent therevnto) he humbly desireth that all the same may be brought into this Courte by the order thereof And that a ducens tecum may be therein awarded for the same accordinglie against him And whereas the said defend^tes^ doe labour and trouble themselues to abate and pull downe the value of the Complayn^tes^ parte as yf it weare litle worth and make a greate matter of his non payemente of his porcion of the rente wch he never payed but out of the profittes of the same and of the newe buildinge of the said play howse and galleries to answeare the same fullie and to gyve good satisfaction to this honorable Courte therein he sayeth and will averr and proue that the yssues profittes and rentes of the reasidewe of the said demised premises over and besides the play howse and galleries will satisfie and pay (as yt was still vsed and accustomed to paye) the whole rente reserved to the said Nichalos Brend. And for the full proofe and manifestacion thereof he the sayed Complayn^t^ sayeth that he doeth and will offer to accepte and take to himself solie for all his partes all the reasidewe of the howses buildinges gardens and groundes soe demised by the said Nicholas Brend (exceptinge onelie the said playhowse and galleries wch the said defend^t^ and the rest (other then the said Complayn^t^) shall and may solelie haue retaine and keepe to themseules for and in consideracion of the said residue, And that he the said Comp^lt^ will alsoe for the same satisfie and pay all the said yearely rentes reserved vpon the said lease and geeve good securitie for the paym^t^ therof out of the same residewe soe as he may haue and enioy the same w^thout^ any other chardge or incumbrances according to the said lease of the said Brend notw^thstandinge he is and ought to haue his parte aforesaid in all the same premises dischardged and freed of incumbrances and chardges exceptinge the same rent thervpon reserved over and aboue wch rent he the said Comp^lt^: hath hearto-

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fore had and receaued de claro p*er* ann*um* betweene thirtie and fourtie pound*es* and byn answered soe by hand*es* of the said def^{t} John Hem*m*yng*es* for diu*er*s and sundrie yeares for a seaventh p*ar*te onely when all the said p*re*mises weare not of that yearely value by much as they now are. without that that the said Anne did not make the said Assignem^{t} of the said tearme of yeares and interest of and in the fifth p*ar*te of the said moitie to the said Comp^{lt}: before theire intermariage as by the said def^{t} Hem*m*ing*es* is vntrulie suggested and surmised and wthout that that after theire said intermaringe the said Comp^{lt} claymed the same p*ar*te onelie or in the right of the sayd Anne as executrix of the said Augustin Phillipps or if he had soe done that the same is materiall or that the said assignem^{t} made vnto the said Comp^{lt}: was, is, or can be voyde in lawe, Or that by the said deede in the answeare of the said def^{t} Heming*es* menc*i*oned the said Auguistin Phillipps had onely a fifth p*ar*te of the moitie of the said play howse galleries gardens and ground*es* during the tearme of yeares thereby demised and yet induringe in manner and forme as in the said def^{tes} answere is alleadged. And wthout that that the said Comp^{lt}: had fourescore pownd*es* or any like or greate some at all out of the hand*es* of the said def^{t} Heming*es* after that he had receaued the some of three hundred pownd*es* of Sr Eusebeus Jsam, Or that the same def^{t} lawfully did or could enter into the said fifth p*ar*te of the said moytie of the said play howse galleries gardens and ground*es* or could lawfullie take the rent*es* issues and profitt*es* thereof, Or that well it was for him soe to doe in manner forme as is alsoe in theire said answeare vntruly is [*sic*] surmised And wthout that that the said def^{t} in charitie and to releeue the said Comp^{lt}: and the said Anne and her Children did from time to time diu*er*s and many tymes or anie time at all deliver to them or to either of them diu*er*s som*m*es or anie some at all of mony as in the said Answeare is falselie and vntrulie alleadged. Jn thexpressinge whereof in and by the said answere the same def^{t} vseth a litle of his smale con*n*ing and craft (wch cannot helpe him) not onelie in his alleadgeing it to be a greate some wch is soe greate as he was and well might be ashamed or abashed (yf anie

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shame at all he had) to expresse anie some at all, but alsoe in this pointe especially that he vnder the coullour of his accomptinge wth him and paying the said Comp^lt^: and his said wyeffe such money as was often times to them or to one of them due and payable of right and dutie for theire profitt*es* and com*m*odities of the said demised p*re*mises by him then receaued wch was soe payed and answered accordinglie and not otherwise then as a pigge of his owne sowe would newe Cloke and coullor the same (as he indeavoreth) to be by him done and gyven out of charitie and to releeue the said Complayn^t^ and his said wyeffe and Children wherein to make the dissimulac*i*on and hipocracie of the same defend^t^ more notorious and rem*ar*kable it shall evidentlie appeare to this hono^ble^ Courte that he is soe farr from all charitie and good dealinge that he will not without compulsion paie and satisfie the said Comp^lt^ soe much by a greate deale as is to him due and answerable both in lawe and equitie, and for wch he hath noe good coullo^r^ nor pretence of right or title vnto but would for verie little or rather noe consideraci*o*n at all take and gaine to himself a matter of great profitt and worth and the onelie staie and state wch the said Comp^lt^ hath leafte to liue and to releeue himself his wyeffe and Children And that there is nothing at all to him payed or answered for or in respecte of the same wherein he mightilie (although in vaine) racketh and stretcheth his wyttes for verie poore and simple shiftes quirkes and galles to coullor and sett forth the same as the said release w^th^out consideraci*o*n and the false recitall of his lease by him made and the nonpaym^t^ of the said Complayn^tes^ parte of the said rente, And alsoe the non paym^t^ of fiftie pownd*es* for his p*ar*te to reedifie and newe build the said play howse and galleries, whereas the same defend^t^ not onelie ever had more then sufficient of the said Complayn^tes^ money to him due in the hand*es* and custody of the same defend^t^ to paie the said rent but alsoe hath and longe time haue had farr more money of the said Complayn^tes^ out of the rent*es* and profitt*es* of the demised p*re*mises then he did demaund or requier for the newe buildinge therof or then his p*ar*te or porc*i*on doeth or can amounte vnto for the reedifyinge therof wherein he sayeth and is informed

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by his Councell learned in the lawes that he is not nor was tyed or bound by the lawe to contribute to the newe buildinge of the same wch the said def^tes^ and some other of theire p*ar*tners and fellowe players did in theire defaulte suffer to be burnte and consumed willfullie or at the least verie negligently And the said def^t^ Hem*m*yng*es* hath adioyninge therevnto vpon the same ground and soile soe therew^th^ demised and letten as is aforesaid a faire howse newe builded to his owne vse for wch he payeth but twentie shillinge*s* yearely in all at the most And noe p*ar*te of the same rent to the said Complayn^t^ whoe should haue his said p*ar*te*s* and porcions of and in the same howse wch howse will in a fewe yeares yeild a greater some in rente then the newe buildinge of the said play howse and galleries did cost wch is and will be more chardgeable to repaire then the former was And w^th^out that that the said Complayn^t^ is or ought to be barred by the said release both in lawe and equytie or by either of them of anie of the said part*es* by him claymed or challenged in the said demised p*re*mises And as vnto the said letter and the lease in the said answeare menc*i*oned supposed to be made by the same defend^t^ the said Complayn^t^ sayeth that the same and the recitall therein alsoe and the forfaiture therof are idle and imp*er*tinent matters nothing materiall to him nor to the cause now in question And that the same lease was invented procured and gev*en* when the said Complayn^t^ was pore and distressed by the said defend^t^ to stoppe and w^th^hould him from his said former estate tytle and lease wch the same def^t^ would not dep*ar*te wth nor restore to the said Comp^lt^ after his repaym^t^ of the said fiftie pownd*es* wth fiftie shillinge*s* interest vpon the said mortgage but most vnconcionably inuriouslie and vnduelie detayned and w^th^held from the said Comp^lt^ to drive him to take the said newe estate or last lease to prevent the same defend^t^ wherein the said Comp^lt^ by the advise of his said Councell was willinge and desireous to relinquish the same wherein alsoe the charitie and releefe of the said defend^t^ wherof he bosteth and braggeth w^th^out cause severall times may alsoe appeare whoe would take advantage thereof or of anie thinge else he could w^th^out gyving of anie recompence or con-

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sideracion to the said Complaynt for or in respecte of the same lease. And as vnto the same defendt his gifte of the said tearme of yeares and interest of and in the one moitie [of] the said parte of the said moitie of the said garden plottes and ground to the said other defendt Henry Condall gratis the said Complaynt sayeth That the same is alsoe idle and frivelous matter wherein the said defendt Hemmynges sheweth howe liberall he could be of another mans goodes and lease and what lardge thounges he can cutt out of another manns hide wch he would not haue done of or for that wch was his owne and did that but to haue helpe and assistance to ioyne with him to keepe out and wrounge the said Complaynante therein as was and is done to the benefitt of either of the same defendtes whoe would share and devide all that parte and portion of the said Complaynante betweene them the said defendtes wch for the said defendt Hemmynges (as the proverbe sayeth) is but a kind of robbinge, to robbe Peter to pay Paulle And therefore finallie forasmuch as the same defendt Hemmynges is soe litle behoulden to his neighbours that he is inforced to be the trumpeter and setter forth of his owne praises or commendacions and driven to magnifie and extolle himself and his virtues (wch he soe much without all cause coveteth) to helpe the same, and to geve the said Complaynt and his frendes iust occasion soe to doe and publishe his pyttie and Charitie vpon iust occasion, he sayeth that the said defendt Hemmynges may easilie procure the same by sufferinge the said Complaynt to haue soe much from him out of his parte and porcion of the said demised premises as he confesseth he hath geven gratis to the said other defendt Coundall for wch he shall not onelie haue verie many thankes and good reportes and that right worthelie and deservedlie but alsoe shall verie desirouslie be duelie payed yearelie thirteene pownds six shillinges and eight pence by the said Complt: for the same and haue securitie and assurance for the performance and accomplishmente thereof, wch because it is much more worth, he is well assured the said defendt Hemmynges will not either out of his pittie and charitie or out of his bountie and liberalitie or anie other of his vertues (whereof he is soe much defective and insensible) accepte or take notwth-

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standinge anie charitable request and good offer that the said Complaynt can or will make, wherby and in the rest before herein recited the whole truth may evidently appeare, and here like himself he the same defendt sheweth himself in his said Answere, and in the matter wherein with fallacies and decieptes he indevoreth and seeketh to shadowe and obscure the truth and to abuse this honorable Courte, of all wch the said Complaynt prayeth the due consideracion of this honorable Courte And lastly without that that anie other matter thinge clause sentence cause or article whatsoever materiall or effectuall contayned or mencioned in the said Answeares of the said defendtes or either of them, And by the said Complt: to be replyed vnto and not herein before sufficientlie confessed and avoyded traversed and denyed or otherwise replyed vnto is true. All and everie wch thinges matters and allegacions the said Complaynt is and wilbe readie to averr and prove as this honorable Courte shall award. And prayeth as he before in his said bill hath prayed./

John: Walshe

[5]

Witness Book, 16 James I to 1 Charles I, Miscellaneous Books, vol. 200.

[List of witnesses examined *ex parte* Witter Hilary Term, xvij° James I (1620).]

John Witter gent *plaintiff*	Thomas Woodford gent James Knasborough gent
John Heminges and Henry Condall gent deftes	

[6, 7]

[The depositions of Thomas Woodford and James Knasborough, taken February, 1620, are wanting.]

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[8]

Decrees and Orders, Miscellaneous Books, vol. 29, p. 598.

[Badly damaged. Outer edges rotted away.]

Termino Trinitatis Anno 17°

28° Maij A° 17° et 52°

[Towchin]g the cause at the sute of John Witter compl^{t} against John Heminge*s* [and] Henry Condall def^{tes} vpon the mocion of m^{r} Wilbraham of [councel]l wth the said compl^{t} yt is ordered that the said def^{t} Heminge*s* [having con]venyent notice of this order shall attend this court . . . t wth the lease & deede of mortgag[e] mencioned in the [bill of Complaint] . . . shall then at his p*er*ill shewe cause whie the . . . [deli]u*er*ed into the safe custody of this court . . . ma^{tes} Councell in this court shalbe thou[ght] . . . layde out vpon the said mortgage being . . . ed in his answere to be receaued(?) at the day . . . ith . . . due for the same And further it is ordered that . . . the said def^{tes} answere shalbe referred to the . . . retayned, who is requyred by this court to . . . imp*er*tinencie thereof and to report his opinion . . . and therevpon the further order of this court [shall proceede as to ius]tice shall app*er*teyne./

[9]

In eodem, p. 613.

[Very badly damaged. Only a few words, on the inner margin, remain. The rest of the page is rotted away.]

Quinto die Junij A° &c 17° et 52°

Witter
Heminge*s*

Towching [the caus]e at the [sute of John Witter complainant against John] Heminge*s* and Henry [Condall defendants].....
of Councell on both .....
p*ar*ties shall p*ro*ceede.....
in the meane.....
in the form*er* order.....
& p*re*sence(?) shalbe set.....
for any form*er* order.....

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[10]

Decrees and Orders, Miscellaneous Books, vol. 30, fo. 761.

[Final decree, dismissing the case forever.]

xxix die Novembris A° &c 18° et 54°

Witter Hemingᵉˢ Whereas John Witter long sithence exhibited his bill of complaint vnto the Kingᵉˢ maᵗᵉ & his highenes Counsaill in his ho: Court of Whitehall at Westm*inster* against John Hemmingᵉˢ gent & Henry Cundall deftᵉˢ, Vnto wᶜʰ Bill the said deftᵉˢ forthwᵗʰ made theire full and p*er*fect answeres, Wherevnto the complᵗ replyed & exa*min*ed certen witnesses above two Termes now past, & hath ever sithence fayled to proceed in his said cause as by the due & ordinary course of this court he ought to haue done It is therefore by his maᵗᵉˢ said Counsaill of this court ordered that the same matter be from henceforth out of this court cleerely & absolutely dismyssed forever, & the said deftᵉˢ are licensed to dep*ar*ᵗ at theire lib*er*ties sine die, And it is further ordered that the compl*ainant* shall vpon sight or knowledge hereof content & pay vnto the said defᵗᵉˢ the full som*m*e of xxˢ for theire costᵉˢ herein most wrongfully susteyned./

III.

THE KEYSAR-BURBAGE CASE.

When Shakespeare and six of his theatrical associates in 1608 leased the Blackfriars theatre of Richard Burbage, they did it only after carefully protecting their rights against any claims of the former lessee and sharers who had been managing there the famous company of boys known in Elizabeth's reign as "The Children of the Chapel" and under James I as "The Children of the Queen's Revels." For certain satirical skits on their stage against the English King, and finally against the French King, this Children's company was suppressed by the drastic order of James I in the early spring of 1608, as shown by still other new

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records to appear in the third volume of *The Children of the Revels.* Thereafter the Blackfriars stood vacant until taken by the Burbage-Shakespeare company, August 8, 1608, as first related by the Osteler-Hemynges records and the following new set of documents.

Out of the suppression of the Children's company and the later transfer of their theatre to the Burbage-Shakespeare company, differences arose among the former sharers resulting in numerous bitter suits at both law and equity, which furnish us with much of our information concerning the history of Blackfriars theatre. Some of these suits have been published, from James Greenstreet's transcripts, in F. G. Fleay, *A Chronicle History of the London Stage* (1890), while a first account of others appeared in the London *Times,* September 12, 1906, and extracts and data from these and several others besides, all yet to be published *in extenso,* as announced, were presented by me in *The Children of the Chapel at Blackfriars 1597–1603* in *University Studies,* April-July, 1908.

The quarrel did not confine itself to the former tenants of the Blackfriars. One suit, six months after the above transfer, was directed by Robert Keysar, goldsmith, a shareholder in the defunct Children of the Queen's Revels company, against the new lessees, the records of which constitute the set of nine new documents from the Court of Requests published in the present section.

The Bill of Complaint is based upon promises claimed to have been made by Richard Burbage, Cuthbert Burbage, John Heminges, Henry Condell, " and others " of the company. Shakespeare is not specifically named, and may or may not have been one of those to whom Keysar says he repaired and of whom he received certain promises in reference to the Blackfriars. But since he was one of the members of the company, this suit, praying for no less than a one-sixth interest in the theatre and its profits, vitally concerns Shakespeare and all the other sharers of the company alike.

A study of these records will yield corrective and new results worth the time to any one familiar with previous histories.

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Robert Keysar has long been known to me among unpublished theatrical records, although only one printed document mentions him, quite incidentally, as "one Keysar." He is, in fact, a prominent owner in the Children of the Queen's Revels at Blackfriars in and probably before 1608, and thereafter, in connection with Woodford, Rosseter, and others, of the new company at Whitefriars under the old name of Children of the Queen's Revels. He secured his first interest through purchase of a share in the Blackfriars company from John Marston, the dramatist, and was to the poets and players there, from some of the unpublished records just referred to, the Philip Henslowe of the organization, who lent some of them money on different occasions.

Up to 1601, the date of *Poetaster,* Ben Jonson and George Chapman were the sole poets of the Blackfriars Children. Thereafter Jonson wrote for other players, and Chapman and Marston became the exclusive Blackfriars poets from that date to the suppression in 1608. Marston now turns out to have had a financial interest in the Children's company at Blackfriars, which may explain a few allusions not before clear. He was thus their Shakespeare, being poet and sharer in one. The date of his acquisition of a share is not known. Just when he ceased his connection as dramatist and shareowner with the Blackfriars these documents do not openly declare. But it is made evident from Keysar's reported conversations with the Burbage-Shakespeare company relative to their contemplated lease of the theatre and his own contemplated purchase of Marston's share for 100*l.* at that time, that the transfer occurred and Marston's connection ceased about the date of the suppression, perhaps in the spring of 1608. Since we know from a published document that "one Keysar" was interested in the Blackfriars before its suppression, even to the extent of paying rent, and from yet others that the negotiations for transferring the Blackfriars lease had been considered by Evans, the lessee, and Burbage, the owner, for a long time before the transaction was completed, it is possible that the deal between Marston and Keysar was made in 1607.

At the date of Cuthbert Burbage's affidavit, June, 1610, John

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Marston as one of the material witnesses to be summoned is " clerk," or preacher, of Barford, Wiltshire, near the residence of his father-in-law, who, Ben Jonson ten years later jokingly said to Drummond of Hawthornden, wrote all of Marston's plays for him, while Marston wrote his father-in-law's sermons.

The depositions of witnesses mentioned in Cuthbert Burbage's affidavit as material to the defendants would, if they existed, greatly enrich the history of the Blackfriars. For further comment on these, see bracketed note at close of the affidavit.

The largest point of interest in the new documents centres about Keysar's charge that the Burbage-Shakespeare company had formed a theatrical trust by buying up all the private theatres, and suppressing such as they did not want to conduct. The only private theatres then were Blackfriars, Paul's, and Whitefriars. The defendants admit only a part of the charge, namely, that they did purchase the Blackfriars and have also paid their half of a dead rent of 20 *l.* for the year to Edward Pierce, Master of the Paul's Boys, to keep that theatre closed. The proprietors of Whitefriars, they say, paid the other half.

How and why Paul's Boys ceased to act has been explained in a variety of ways. These documents furnish the single needed word of fact that settles the question. Whether they acted in some part of the Church or outside is likewise removed from speculation.

These documents unite with others to show how, when, and by whom the company called the Children of the Queen's Revels at Whitefriars was organized.

In this introductory word, I do not wish to verge upon analysis of the records, nor even to attempt to suggest the new items of fact. That must be deferred to later publications. I desire here merely to give a brief, general notion of the documents, which speak to the literary-historical student entertainingly and instructively for themselves.

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[1-9]

KEYSAR VS. BURBAGE ET AL.

Court of Requests Proceedings, James I, Uncalendared. Case of Robert Keysar vs. Richard Burbage et al. (Recently withdrawn from circulation, and now preserved separately.)

[Four skins, consisting of Bill 25½ × 17¾; Answer, 24 × 16½; Replication, 23 × 17¼; Rejoinder, 27½ × 11¾; all written clearly, with lines running the long way of the parchments. The chirography is the usual beautiful modified Gothic of the period. Both ink and parchment perfectly preserved.]

[1]

BILL.

[*In dorso*] viij° die ffebruarij Anno Regni Regis Jacobj Angliae etc septimo et Scotiae xliij^co^

Defendentes vocentur per Mandatum nuncij Camerae

To the Kinges moste excellent Matie./

Humblie Complaininge sheweth vnto y^r^ moste excellent Matie, y^r^ highnes Loyall and Obedyent Suplyaunt Robert Keysar Citizen and Goldsmith of London, That wheiras one Richard Burbage gent, was and still ys seised of an estate of inheritaunce in fee or fee tayle of and in an one great Hall or roome, wth Certaine roomes over the same, sett and beinge in the Blackfryers London, erected furnished and buylt wth Stage Gallaryes and seattes, and beinge soe seised did for the tearme of Twentye and one yeares demise the same to one Henrye Evans at the yearlie Rent of fortye pounde, quarterlye to be paide dureinge the said Tearme wch in effluction of tyme ys not yet expired by manye yeares, By force and vertue of wch said lease, he the said Henrye Evans did theirinto enter and was theirof lawfulie possessed, & beinge theirof soe possessed, he the said Henrye Evans did for good and valuable Consideracion afterwardes grant all or some parte of the said Tearme the Certaintye y^r^ Suppliant knoweth not, to one John

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Marston Gent, who by force and vertue theirof did enter in and vpon such p*ar*te and soe much theirof as was ment and intended to be to him graunted, and was accordinglie theirof possessed, and beinge soe possessed, and havinge allsoe one full Sixt parte of and in Certaine goodes apparell for players, p*ro*pertyes, playe bookes and other thinges then and still vsed by the Chilldren of the Queenes ma^{tyes} Revells in and aboute their playes, enterludes and other exercises by them to be acted, shewed, exercised or done, in the said great Hall, or roome, or elswhere, by good Conveyance from the said Evans and others, for the full value of wch said goodes and p*re*misse*s* was at a verye lowe and reasonable appraizment woorth Six hundred pounde at the leaste, he the said John Marston and y^{r} nowe Suppli*an*t did fall into speach and Com*m*unication touchinge the buyinge of his the said John Marston right, Tytle, and interest, of in and to the full Sixt parte of the lease afforesa*id* & of all & singuler his right & interest of in & to the sa*id* sixth p*ar*te of ye said goodes, apparell for players, p*ro*pertyes, playe bookes, and other thinges wch then he had or wch afterwarde was to be had by reason of his ioynt p*ar*tnershipp wth others theirin, and of the Sixt parte of all the p*ro*ffitt and Com*m*oditye to be made theirof and theirby dureinge the Contynuance of the said lease; And in the end it was fullie concluded and agreed by and Betweene y^{r} said Suppli*an*t and the said John Marston that for and in consideraci*o*n of one hundred poundes to be in hand paide by y^{r} said Suppli*an*t to the sa*id* Marston for the full Sixt parte of all and singuler the p*re*misse*s*, he the said Marston should conveye his right and interest theirin and theirvnto to y^{r} said Supli*an*t but y^{r} Suppli*an*t vnderstandinge that their were divers p*ar*tners in the said lease, goodes and p*ro*ffitt to be made as afforesaid, and feareinge y^{t} by some practize and confederacye betweene the sayd Richard Burbage, Henrye Evans and then y^{r} Suppli*an*t might be defeated and Cosined of all or of the greatest p*ar*te theirof, and wthall havinge hard some rumors and flyinge speeches to that purpose wch did increase his feare, y^{r} said Suppli*an*t did make his repaire to the said Richard Burbage and vnto one Cuthbert Burbage, John Hem*m*ing*es*, Henrye Con-

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[illegible] & others beinge all partners [illegible] partners that might
prejudice and wrynge [illegible] in the [illegible] and [illegible] them
that he had [illegible] and agreed [illegible] for a full
[illegible] parte in the [illegible] and [illegible] to
paye to the said [illegible] the same, and
both prayed them and [illegible] that he [illegible] take
noe such Deceptfull and [illegible]
as had beene reported and [illegible] that they [illegible] of
them would [illegible] that they had intelligence
that he [illegible] said Supplant had [illegible] the said [illegible] as
afforesaid, and that he [illegible] the said [illegible] as
the said [illegible] the [illegible] in the
[illegible] as afforesaid, and [illegible] said Supplant
at the same [illegible] that the said
Henrye Evans had beene [illegible] them to
some such act as [illegible]
yet that they [illegible] all
partners and [illegible] & [illegible]
[illegible] to be made as afforesaid [illegible]
whatsoever was [illegible]
the same effect. And [illegible] generallie
made by them all [illegible]
pounde to the said [illegible] Sup-
plant would have [illegible] Sixt parte with
others that had equall interest [illegible]
given flower hundred [illegible] all
with, and that [illegible] Supplant [illegible]
honest practize by [illegible] that they
had by their [illegible] Sup-
plant to proceede and to [illegible] and
by the givinge of some [illegible] Henrye
Evans to the end that he would [illegible] lease
to the said Richard [illegible] made
formerlye to the said [illegible] & Roomes
in the Blackrivers as afforesaid [illegible]
the same, by meanes whe of they the said Richard [illegible]

Cuthbert Burbage, John Hemminges, Henrye Condell and others, have entred in and vpon the said playe howse, and all the said goodes, apparell and premisses and have soe Continewed in the possession for a longe tyme and made proffitt theirof to themselves to the full valewe at the leaste of fifteene hundred poundes, a full Sixt parte wheirof in all equitye and Conscyence doth of right belonge vnto y^r^ Suppliant, but being vniustlie kept out of possession hath not beene by them nor anye of them permitted to doe or performe that wch for his ratable parte he ought and was moste readye and willinge to have done: In tender consideracion wheirof and because they the said Evans, Richard, and Cuthbert Burbage, John Hemminges, Henrye Condell and divers others doe well knowe that y^r^ said Suppliant did paye his said one hundred pounde to noe other end but to have had & enioyed his said Bargaine, and that he hath noe meanes to recover the same againste anye bodye but such as have vniustlie defrauded him, and that they onlie are the said partyes and noe other, and because y^r^ said poore Suppliant in hope to have enioyed his said Bargaine hath kept boyes theise Two yeares to his exceedinge Charge of purpose to have Continewed playes in the said howse vpon the ceasing of the generall sicknes, and hath disbursed by that meanes and by makeinge provision in the said howse for the purpose afforesaid five hundred pounde, and because all the said partyes vpon the repaire of y^r^ Suppliant vnto them and acquaintinge them wth that wch he had in purpose to doe, and wth that wch had beene rummored abroade Concerninge their intention to doe him wronge in the premisses and his earnest request vnto them not to preiudize him theirin did faithfullie promisse y^r^ Suppliant not to ioyne in any act to the hinderaunce of anye man vntill all men interessed theirin had satisfacion, and that vpon the said faithfull promise y^r^ Suppliant did conclude and paye his said hundred pounde, and because if remmedye be not had in this honorable Courte for y^r^ Suppliantes enioyinge the said full Sixt parte of the said goodes, apparell and the premisses wth a full Sixt parte of all the proffitt made in this meane tyme, that then y^r^ Suppliant shall loose his said hundred pounde soe longe forborne and all the

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charges that he hath beene at wth boyes and makeinge provision to the value of fyve hundred pounde as afforesaid, it will tend to his exceedinge great charge for y^t^ he is voyde of all remmedye at at the Common lawe eyther againste the said Marston or any other of the said partyes; That theirfore y^r^ ma^tie^ wilbe graciouslye pleased in a case of such nature and consequence to grant to y^r^ said Suppliant y^r^ highnes writt of Privye seall or the messenger of the Courte to Call into this ho^ble^ Courte the said Richard Burbage, Henrye Evans, Cuthbert Burbage, John Hemminges and Henrye Condell Comaundinge them and everye of them by a certaine Daye and vnder a certaine paine theirin to be limitted to be and appeare in this ho^ble^ Courte of Whytehall before y^r^ ma^tie^ & y^r^ highnes Councell of the said Courte then and their to aunswere to the premisses, and further to stande to and abyde such further order and Direction theirvpon as to y^r^ highnes Councell of the said Courte shall seeme to be agreable to Equitye and good Conscyence, & y^r^ highnes said Suppliant shall as he is nevertheless bounde praye to god for y^r^ highnes longe liffe and happye Raigne over vs././

Raphe Wilbraham.

[2]

ANSWER.

xij° die februarij Anno Regni Regis Jacobi Angliae ffranciae et Hiberniae septimo et Scotiae xliij°./

The ioynt and seuerall aunsweres of Richard Burbage Cuthbert Burbage John Heminges and Henry Condell foure of the defendantes to the bill of Complaint of Robert Keysar Cittizen and Gouldsmith of London

The said defendantes and each of them saveinge vnto him and them selves at all times hereafter all advauntages of exception vnto the vncertenties and insufficiencies of the said bill of complaint for full and perfecte aunswere vnto the said bill or so much thereof as any waie concerneth them the said defendantes or any of them, they the said defendantes and each of them for himselfe sayth

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that the said bill of Complaint as they are verely perswaded is onely preferred against them for molestacion and vexacion sake and thereby to putt these defendantes to vnnecessary and great charges in suites of lawe without iust cause so to doe, And further they the said defendantes for themselves and each of them for himselfe saith that true it is as they and each of them beleeve and are verely perswaded that the said Richard Burbage is seised of and in an estate of inheritaunce of and in all that great hall or roome with certeine other roomes ouer the same sett and beinge in the Blackefryers in London erected furnished and buylt with Stage Galleries and seates as in and by the said bill of Complaynt is sett forth and declared and the said Richard Burbage for himselfe sayth that true it is that he the said Richard Burbage did heretofore for the terme of one and twenty yeares demise the same vnto the said Henry Evans one other of the defendantes in the said bill of Complaint named at the yeerely rent of fortie poundes to be paid quarterly duringe the said terme which said terme of one and twenty yeeres is not yet expired by force and vertue of which said lease he the said Henry Evans did enter in and vppon all and singuler the said premisses and was thereof lawfully possessed as in and by the said bill of Complaynt is sett forth and alleadged, But whether the said Henry Evans did for good and valueable consideracion (or any consideracion at all) graunt all or any parte of the said terme vnto John Marston gent in the said bill of Complaint named or whether the said Marston by force and vertue of any such graunt entred into or vppon such or any parte of the premisses as in and by the said bill of Complaynt is supposed theise defendantes or any of them cannot certeinely depose for that they nor any of them were at any time present at preuie consentinge or acquainted with any dealinges and bargaines made or supposed to be made by or betweene them the said Henry Evans and John Marston neyther doe they or any of them knowe that the said Marston had any such or any parte at all in all or any the goodes apparell for players properties playe bookes and other thinges then now or at any time vsed by the Children of the Queenes Ma^tes^ Revelles in and about their

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playes enterludes and other exercises by them to be acted shewed exercised or done in the said great hall or roome or elswere as in and by the said bill of Complaint is suggested. And these defendant*es* vtterly denie and eu*e*ry one of them for and by himselfe vtterly denyeth that the said Complaynant did at any tyme repaire or come vnto these defendant*es* or any of them and acquainte or tell them that he the said Complaynant had concluded and agreed with the said Marston for a full sixt p*a*rte in the p*re*misses, and that he had or was p*re*sently to paye to the said Marston one hundred pound*es* for the same or vsed any such Communicacion to or with all or any the said defendant*es* or that they or any of them made him the said Complaynant any such p*ro*mise or replyed as in by the said bill of Complaynt is also most vntruly surmised, and these defendant*es* allso vtterly deny and euery one of them for and by himselfe vtterly denyeth that they or any of them did at any time make any such offer vnto the said Complaynant to giue him foure hundred pound*es* or any other some or somes of money in such manner and forme as in the said bill of comp^lt^ is sett forth and declared, or that they or any of them did at any tyme aduise or encourage the said Complaynant eyther by their or any of theire p*ro*mise offers or otherwise to p*ro*ceede and to paye the said Marston the said hundred pound*es* or any other some or somes of money as in and by the said bill of Complaynt is allso most vntruly alleadged. But these defendant*es* say and each of them for and by himselfe sayth that true it is that the said Henry Evans haveinge entred into one bond or obligacion of foure hundred pound*es* vnto the said defendant Richard Burbage for true payment of the said rent of forty pound*es* p*er* annu*m* and into diuers Couenant*es* for repa*ra*cions to be done in and vppon the p*re*misses and p*er*formance of other matters agreed by and betweene them the said Richard Burbage and Henry Evans as by the said bonde & Jndenture of lease wherevnto these defendant*es* for the more certeinty doe referre themselves doth and may appeere and that by reason the said p*re*misses lay then and had longe lyen voyde and without vse for playes whereby the same became not onely burthenson & vn-

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profitable vnto the said Evans but allso ranne farre into decay for want of repa*r*acions done in and vppon the pr*e*misses they the said defendant*es* or some of them entred into Communicacion with the said Henry Evans aswell for satisfaction of the said bond & Couenant*es* then forfeited vnto the said Richard Burbage as for the repairinge of the pr*e*misses & soe mayneteynynge the same for & duringe the tyme to come vnexpired demised in and by the said lease in due and necessarie repa*r*acions which he the said Henry Evans fyndynge himselfe as these defendant*es* are verely p*er*swaded vnable to p*er*forme and beinge vnwillinge any longer to charge himselfe with so great and vnnecessary a burthen he the said Evans began to treate with the said Richard Burbage about a surrender of the said Evans his said lease which fynally for and in regarde of some Competent Consideracion giuen him in recompence of his the said Evans his Charge form*er*ly bestowed in buildinge*s* in & about the pr*e*missed was accomplished and the said Evans his whole estate of in & to the pr*e*misses was surrendred by the said Evans vnto the said Burbage who accepted the same surrender accordingly (without knowinge of or intendinge to preiudice the estate of the said Marston or the Complaynant or eyther of them,) as he hopeth it lawfull was for him to doe especially the pr*e*misses beinge in such decay for want of repa*r*acions as then they were, & the said defendant*es* Confesse that true it is that sithens the said surrender made by the said Evans to the said Richard Burbage as aforesaid which was about the tenth of August last past they the said defendant*es* have entred into occupied & enioyed the said great hall or play house & taken the benefytt & pr*o*fytt thereof & have reiected the said Complaynant from intermedlinge with them in any sort as they hope vnder fauor of this honorable Court it lawfull was & is for them to doe, but they the said defendant*es* & eu*e*ry of them for himselfe doe vtterly deny that they or any of them haue at any time intermedled with had enioyed or received any the good*es* or appa*r*ell mencioned in the said bill of Complaynt or have at any time converted them or any of them to theire or any of theire owne vse vses benefitt or behoofe without that that to the knowl-

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edge of these defendant*es* or any of them the said good*es* & p*re*misses were at any time worth at a lowe & reasonable apprays-ment the valew of six hundred pound*es* at the least or that the said Complaynant paid in hand one hundred pound*es* to the said Marston for the full sixt p*ar*te of all & singuler the p*re*misses or that these defendant*es* haue made fifteene hundred pound*es* p*ro*fitt of and by the p*re*misses at any time since the said sur-render made as aforesaid or that the said Complaynant did pay the said some of one hundred pound*es* if he paid any to the said Marston to no other ende but to have & enioye his said bargaine of & in the p*re*misses, or that the said Complaynant hath to that onely ende and purpose kept boyes by the space of two yeares last past to his exceedinge Charge, or that the said Complaynant hath disbursed by that meanes & by makeinge p*ro*vision in the said house for the purpose aforesaid five hundred pound*es* or any other some or somes of mony at all as in & by the said bill of Complaynt is suggested, and without that that any other acte matter or thinge in the said bill of Complaynt Conteyned & herein not sufficiently aunswered vnto Confessed & avoided trav*er*sed or denyed is true, all which these defendant*es* & each of them are ready to averre & p*ro*ve as this honourable Court & the M^rs^ thereof shall awarde & therefore they most humbly pray that they may be from thence dismissed with theire reasonable Cost*es* & Charges in this Cause most wrongfully susteyned./

Viuian

[3]

REPLICATION.

xxij° die Maij Anno R*egni* R*egis* Jacobj Angliae
ff*ranciae* et Hib*er*niae Octavo et Scotiae xliij°

The Replicac*i*on of Robt Keysar Compla*i*n*an*te to the ioynte and seu*er*all Answeres of Richard Burbage, Cuth-b*er*te Burbage John Hem*m*inges & Henry Condell def^tes^./

This Compla*inan*t doth and will averr and maintaine his said Bill of Compla*int*, and that the matt^rs^ theirin alleadged are not p*re*-

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ferred against them or against any of them for molestacion and vexacion sake theirby to put them to vnnecessarye and great Charges in suite of Lawe, w^th^out iuste cause as by their said Aunswere ys moste falslye and moste vainlye alleadged, for this Complainant ys not soe profuze and Lavishe of his expences eyther in Lawe or otherwize, howsoeuer the deffend^tes^ by their false and Treacherous dealinge wth him (in this matter wheirof he nowe Complaineth) have exasperated and provoaked him againste them, as to spend his monye and looze his tyme vpon so perfydeous persons, vnlesse his Complaynte were iuste and full of Equitye, and soe to be manifested by good proffe w^th^out exception, and theirfore as he this Complainante is well able to maintayne his said Bill of Complainte to be good certaine and sufficyent, and the matt^rs^ theirin alleadged to be iuste and true, and theirfore fitt to be aunswered vnto: Soe on the Contrarye parte doth this Complainante averr that the defend^tes^ said aunsweres are verye vncertaine, vntrue and insufficyent in the Lawe to be Replyed vnto for manye grosse and apparaunte faultes and imperfectiones theyrin moste plainlie appearinge, the advantage and benefitt of Exception wheirof nowe and at all tymes hearaft^r^ to this Complainante saved for Replicacion theirvnto he saithe in all thinges as in his said Bill of Complaint he hath saide, wth this allsoe, that the said Complainante will averr and prove, that the saide deftes not Contentinge themselves wth abuseinge him by their encouragm^tes^ to proceede wth their Bargaine in the said Bill of Complaint mencioned, wth the said John Marston, and soe to paye his said hundred pounde for the particulars in the said Bill likewize mencioned wch they secretlye mente and intended that he this Complainant should never enioye, but be by their fraude vtterlie defeated both of monye and Bargaine as much as in them laye, but wth an inveterate and increasinge mallice towardes him this Complainant, they the said defend^tes^ intendinge their vttermoste skill and power to Supplante this Complainant from havinge anye Commerce or deallinge in anye matt^rs^ of playes or enterludes, did aft^r^ such tyme as they had entred vpon the said howse and goodes for wch the Complainante had payde as affore-

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said, receiue the *said* Evans into the *said* howse wheir they keep him secrett from this Compl*ainant*, & so devide & share the *said* good*es* & p*rofitt*e*s* amonge themselves, to the exceedinge losse and hindrance of this Compl*ainant* and havinge theirby fraudulentlie disapointed this Compl*ainant* both of howse, good*es*, and all his iust and rightfull p*rofitt* to have beene made theirby, then allsoe did they in furth^r^ Testimonye of their mallice privatelye Contract wth the owners of all the private playe howses w^th^in the cittye of Lond*on* for one whole yeare, and for the same did satisfye and paye a dead rente to the owners theirof, to their owne great losse and hinderance, intending nothinge theirby but the advancem^t^ of their exceadinge mallice to this Compl*ainant*e and his vtter overthrowe, soe farr forthe as by any possibillitye laye in their power, and by that meanes did exceedinglie hinder this Compl*ainant* who all that tyme had a Companye of the moste exparte and skillfull acto^rs^ w^th^in the Realme of England to the number of eighteane or Twentye p*er*sons all or moste of them trayned vp in that service, in the raigne of the late Queene Elizabeth for Ten yeares togeath^r^ and aft^r^wardes p*re*ferred into her ma^ties^ service to be the Chilldren of her Revells by a patent from his moste excellent Matie, but kept and mainteyned at the Cost*es* and Charges of this Compl*ainant*e vntill nowe by the malitious practizes of the defend^tes^ as afforesaid, they are enforced to be dispersed and turned awaye to the abundante hurte of the said young men, the disapointinge of her Maties said service, and to the losse and hinderance of this Compl*ainant*e at leaste of one Thousand poundes All wch thinges beinge advisedlie considered and Compared togeath*er*, this Compl*ainant* doubteth not, but this Courte will theirof take ho^ble^ and iuste consideracion for this Compl*ainant*e*s* releife againste the malitious enterprises and iniuryous oppressions to him offered by the *said* defend^tes^: W^th^out that that the said defend^tes^ or any of them were or is ignorant that the said Henrye Evans in the Bill and Aunswere mencioned, did grant all or any p*ar*te of the Tearme in the Bill mencioned to the said John Marston for good and valuable Consideracion, or for any Consideracion at all, or were doubtfull whether the said John Marston by force of any graunte from the

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said Henrye Evans did enter vpon the premisses, as by their said Aunswrs they doe moste vntrulye pretend: And wthout that, that the said defendtes or any of them were ignorant that the said John Marston had any such or any parte att all of in or to the said howse or Roome in the Bill mencioned, or of in or to anye the goodes, apparrell for players, propertyes playbookes and other thinges as by their said aunswers they doe moste falslye and subtillye pretend, And wthout that that this Complainante did not repaire and Come vnto the said defendtes, and acquainte and tell them that he had Concluded and agreed wth the said John Marston for a full Sixt parte in the premisses and that he had or was presentlie to paye to the said John Marston one hundred poundes for the same, and that theirvpon they did not make any such promisse or Replye, as they the said deftes in their said Aunswrs have moste falslye and vntrulye deposed, And wthout that that the said deftes did not then offerr to give ffower hundred pounde to this Complainant, or that they did not advise and encourage this Complainant to paye the said hundred pounde to Marston as afforesaid, as by their said aunswers ys moste vntrulie alleadged: And wthout that that the Surrender made by the said Evans to him the said Burbage, was trulye and Bona fide in respect of any the pretences and probable shewes in the said aunswers mencioned, but onlye of mallice and purpose to defraude deceive and disapointe this Complainante of his said Bargaine theirin, and to the verye end that he might be Cozzined of his said hundred pounde, soe farr forth as theire mallice and faithlesse deallinge could helpe and enduce theirvnto: And wthout that that they the said deftes or some of them have not since the paymt of the said hundred poundes to the said Evans, and since the promisse made by the deftes or some of them to this Complainant, and their encouragemt by them vsed for his this Compltes proceadinge and Concludinge in the said Bargaine as afforesaid, have not entermedled wth, had enioyed or received any the goodes or apparell in the Bill mencioned, or Converted the same or anye parte theirof to their or any of their vse or vses, as by the said deftes ys moste falslye denyed: And wthout that that any other matter or thinge ma-

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teryall or effectuall in Lawe to be Replyed vnto in the said deftes aunsweres Contained and not hearin sufficyentlie Replyed vnto Confessed and avoyded Traverssed or denyed ys true: All wch matters this Complainant ys reddye to averr and prove as this hoble Courte shall awarde and prayeth as before in his said Bill of Complaint he hath prayed././

Raphe Wilbraham.

[4]

REJOINDER.

xix° die Junij Anno Regni Regis Jacobi Angliae ffranciae et hiberniae octauo et Scotiae xliij°

The Reioynder of Richard Burbage Cuthbert Burbage John Heminges and Henry Condell defendtes to the Replication of Robert Keysar Complt./

The said defendtes for Reioynder vnto the said Compltes Replication say and each of them for and by himselfe sayth in all and euery thinge and thinges as in their said Aunsweres they haue sayed And doe and will averre iustefy mainteyne and proue the same and all and euery thinge and thinges clause sentence Article and allegacion therein conteined to be good iuste and true certeine and sufficient in the lawe to be replyed vnto in such sorte manner and forme as the same be therein most truely sett forth and declared And these defendtes further saye and each of them for and by himselfe sayth that the said Replication of the said Complt is very incerteine, scandalous, vntrue and insufficiente in the lawe to be reioyned vnto for many apparant faltes imperfections slaunders and absurdeties therein conteined And that the same is so made and contriued of meere malice and spleene by the said Complt for the causes in the said aunswere expressed. And to the ende to giue some Cullor or rather shaddowe for the mayntenaunce of the said Compltes bill, without iust Cause in this honorable Cort to the vniust scandall and vexacion of these defendtes as may appeere ffor that the said Compltes Bill and the matters for which he therein complayneth and for which he

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principally seeketh to be releeved in this ho: Co^rt Consisteth Cheifely in theise two partes ffirst to obteine an interest in and to one sixt p*ar*te of the said playe house or great Roame & galleries vsed for playeinge in the said Comp^ltes bill mencioned wch as the said Comp^lt suggesteth he bought of one John Marston gent in the bill named which Marston as allsoe the said Comp^lt (though vntruly) suggesteth had the same passed vnto him from Henry Evans in the said bill allsoe mencioned Vnto wch said first p*ar*te these def^tes & eu*er*ye of them for & by himselfe sayeth That the said Henry Evans neuer graunted assigned or sett ou*er* any such estate or terme at all of in or vnto the said howse Roome or galleries vnto the said John Marston as in and by the said bill of Comp^lt is supposed or any other estate or terme of in or vnto the said howse Roome or galleries neither could he soe haue done if he would but the same was & would haue bene p*re*sently voide for that as these def^tes by theire learned Counsell are enformed he the said Henry Evans was restrained in & by his said lease had from this def^t Richard Burbage from grauntinge assigneinge or puttinge away the p*re*misses or any p*ar*te thereof for any terme whatsoeu*er* or vnto any p*er*son whatsoeu*er* Neyther did the said Marston as these def^tes are Credibly enformed & doe verely beleeve to be true sell graunte or assigne any p*ar*te at all in the said howse Roome or galleries vnto the said Comp^lt Neyther is there any menc*i*on at all made thereof in any deede or writinge made or passed from the said Marston vnto the said Comp^lt as these def^tes are credibly enformed and doe verely beleeve to be true So as then for the said first & most principall p*ar*te of the said Bill the said Comp^lt hath noe iust Cause to Clamo^r scandalize or Complayne against them these def^tes. And as touchinge the Second Mayne p*ar*te of the said Comp^ltes bill of Comp^lt by which he allsoe Claymeth to haue from these def^tes one full sixt p*ar*te of the Apparell good*es* playebookes p*roper*ties for playes & other like thing*es* Complayned of in the said Comp^ltes bill these def^tes saye & each of them for & by himselfe sayth that they nor any of them now haue or at any tyme had any p*ar*te or porc*i*on of the said good*es* app*ar*ell playe bookes p*roper*ties & other like thing*es*

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mencioned in the said Bill of Complt nether did they or any of them euer meddle or haue to doe wth them or clayme or haue any interest vse or property of in or to them or anie of them But these deftes Confesse that they haue heard that they are in the keepinge of the said Henry Evans who hath caused the same to be appraised by honest & indifferent men & hath made & taken a true Inventary of them as these deftes haue likewise heard accordinge wherevnto he allwaies was & yet is ready to deliuer such parte & porcion thereof vnto the said Complt as his parte shall or may amount vnto By both wch said partes of the said Compltes bill the malice Idle humor & causeles vexacion togeather wth the slendernes of cause & malicious spleene of the said Complt towardes the said deftes doe most Clearely declare & shewe themselues And these deftes further say & each of them for & by himselfe sayth vnder favor of this ho: Cort that they much marvaile that the said Complt should desire soe apparently to sett forth his folly on Recorde as to charge these deftes in & by his said Replication with malice towardes him in Contractinge priuately wth the owners of all the private playehouses within the Citty of London for one whole yeare & for the same to paye a dead rent to the owners thereof to these deftes owne great losse & hinderance But to the intente onely thereby to aduance theire malice & to ouerthrowe the said Complt onely soe farre forth as by anie possibility laie in theire power: When as the said Complt might in truth thereby if the said suggestion were true be perfectly perswaded & assured that these deftes should be not onely malicious as he the said Complt most iniuriously suggesteth but allso malicious fooles if to doe the Complt a little hurt if they might which allsoe must needes be vncerteyne to them they the said deftes should doe themselues a farre greater & more certeine losse And when as allsoe the Contracte made with the owners of the said private playe howses if any such were hath allwaies bine soe farre from the ouerthrowe hindrance or losse of the said Complt that the same hath allwayes bine & yet is aswell to & for the vse benefytte & profitte of the said Complt himselfe & his partners according to the said Compltes parte & rate as to the benefyttes of these

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defendtes or any of them accordinge to their seuerall partes & rates as these deftes haue credibly heard & doe verely beleeue ffor these deftes saye & each of them for & by himselfe sayth that there beinge as these deftes verely thinke but onely three private playe howses in the Citty of London thone of wch beinge in the Blacke fryars & in the handes of these deftes or of theire assignes One other beinge in the white ffryers in the handes or occupacion of the said Complt himselfe his partners or assignes & the third neere St Pawles Church then beinge in the handes of one Mr Pierce But then vnvsed for a playe howse One Mr Roseter a partner of the said Complts delt for & Compounded wth the said Mr Pierce to the onely benefytt of him the said Roseter the now Complt the rest of theire partners & Company (& without the preuetie knowledge or Consent of these deftes or any of them & that thereby they the said Complt & the said Roseter & their partners & company might aduance theire gaines & profitt to be had & made in theire said howse in the white ffryers That there might be a Cessation of playeinge & playes to be acted in the said howse neere St Paules Church aforesaid for wch the said Roceter Compounded with the said Pierce to giue him the said Pierce twenty poundes per Annum But these deftes afterwardes Cominge to playe at their said howse in the Blacke ffryers And the said Roceter perceyvinge that the benefytt of the said Cessation of playes at Powles did or was likely to turne aswell to the benefytt of these deftes and theire Companie as to the benefytt of the said Complt the said Roceter & the rest of theire Companie & yett that the whole matter of Charge for payment of the said twenty poundes per Annum was of necessety to lye onely on the said Complt the said Roceter & the rest of their Compaine he the said Roceter came vnto these deftes or some of them & intreated them that for the ease & benefytt of the said Complt & his Company & partners who finde themselues thereby ouercharged & agreeued they the said deftes haueinge as he alleadged as great benefytt as themselues & yett were bound to nothinge would neuertheles be content to beare & paye one halfe of the Charge of the said rent of twenty poundes per Annum wherevnto these deftes in all loue & aswell for the benefytt of the

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said Compl^t accordinge to his parte as of any other person or persons willingly did yeeld & accordingly haue payed there parte of the said rent wherein alsoe the mallice & ingratitude of the said Compl^t is most perspicuous & plaine whoe Canne be Contented to receaue dayly benefytt not onely by the Cessation of the playes in the said howse neere Powles But allsoe out of these def^tes purses in ready money & yet cannot bridle his envye toward these def^tes But ceaseth not most vnchristianlike to charge them wth falsehood Cosenage treachery perfidiousnes mallice fraude practize to the ouerthrowinge of the Compl^tes estate iniurious oppressions & many other lewde & slaunderous supposalls whereas in trueth & as by the premisses plainely may appeere he the said Compl^t hath no iust cause of suite much lesse anie cause at all to vse or sett forth anie such scandalous & vile speeches against these def^tes or any of them as in & by the said Compl^tes bill & Replication are sett forth vttered & declared without that that these def^tes or any of them haue or did at any tyme receaue or keepe the said Evans secreatt from the said Compl^t & soe devide & share the said goodes and profyttes amongst themselues as in & by the said Replication is most vntruly surmised. But rather to the contrary these def^tes verely thinke that the said Compl^t surceaseth & in truth neuer meant to proceede against the said Evans for feare least that he knoweinge the truth of all the said Compl^tes vntruthes should discouer more then the Compl^t would willingly haue knowen And yett the Compl^t by incertinge his name into the said bill of Compl^t thinketh to take awaie the said Evans his testimony from these def^tes wch these def^tes hope vnder fauor of this ho: Cort shall not be permitted And without that that the said Compl^t had at any time to these def^tes knowledge any such companie of the most expert & skillfull Actors within the Realme of England to the nomber of eighteene or twentie persons kept & mayneteyned at the Costes & Charges of the Compl^t Or that they were disperced by the maliceous practizes of these def^tes as in & by the said Replication is surmised ffor that these def^tes haue heard it credibly reported & doe verely beleeue it to be true that those Actors wch he the said Compl^t had & kept allthough none such eyther of

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quality or nomber as in & by the said Replication is surmised were disperced & driven each of them to *pro*vide for himselfe by reason that the playes ceasinge in the Citty of London either through sicknes or for some other cause he the said Comp^lt^ was noe longer able to mayneteyne them togeither wch ought by noe meanes for the reasons aboue declared to be imputed vnto anie falt in these def^tes^ And without that that the said Comp^lt^ hath lost by the dispersinge of the said Companie at the least one thousand poundes As in and by the said Replication is most vntruely & vaineglori-ously surmised onely to raise the Credditt of his estate wch these def^tes^ verely thinke was neu*er* soe good as to be able to disburse so great a stocke as could haue brought him in soe great a benefitt. And without that that any other matter thinge or thing*es* clause sentence article or allegac*i*on in the said Replication Conteined specified or declared materiall or effectuall in the lawe to be Reioyned vnto by these defend^tes^ & not heere in this Reioynder sufficiently reioyned vnto Confessed & avoyded trau*er*sed or denied is true All which matters & thing*es* these def^tes^ are ready to au*er* & p*ro*ve as this h: Co^rt^ shall award & therefore they the said def^tes^ pray as before in theire said aunswere they haue prayed./

Viuian

[5]

Court of Requests, Note Book, 6–8 James I (Miscellaneous Books, 152) fol. 260.

[The Clerk's minute book of the Court's orders and decrees, recorded in a rapid and difficult modified Gothic hand as a memorandum of the Court's oral decisions and directions.]

T*er*mino Paschae A*nn*o Regni Regis Jacobi Angliae ffranciae et hib*er*niae 8° et Scotiae 43°/ viz

Monday the xxj^th^ day of Maij and the last day of this p*re*sent Terme/

Robt Keysar vs Richard Burbage et al the def^tes^ vppon notice texamyne their witnesses that the cause may come to hearinge

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the next terme. Yf the def^tes the first of the next terme shewe not cause Mr Wilbraham counsel &c

[6]

[illegible] *Requests, Decrees and Orders, Easter, 8 James I* ([illegible] *Books, 25*) *p.* [illegible]

[illegible] form of the Court's decrees and orders, carefully written out by the clerk from memoranda hastily taken down in the preceding "Note Books."

[illegible]

[illegible] against Richard [illegible] of [illegible]

[illegible]

[8]

Court of Requests, Decrees and Orders, Trinity Term, 8 James I (Miscellaneous Books, 25) p. 232.

[The Court's order, carefully written out by the Clerk in full from the preceding minute.]

Termino Trinitatis Anno *Regni Regis* Jacobi octavo.

Nono die Junij A° *prædicto* [=A° 8° et 43°]./

Keysar Burbage Towching the cause at the sute of Robt Keysar compl^t^ against Cuthbert Burbage and others def^tes^ vpon the mocion of Mr John Walter of counsaill wth the said def^tes^ yt is ordered in p*rese*nce of m^r^ Wilbraham of the pl^tes^ counsaill (any form*er* order notw^th^-standing) that the def^tes^ vpon Affid*avit* to be made that they haue materiall witnesses texamine in this cause setting downe theire names and dwelling places, And that theire desire of further tyme texamine them is not for any wilfull delay to the cause shall haue day texamine theire said witnesses vntill the sixt day of the next terme/ And then publicac*i*on shalbe in the same cause graunted & not before./

[9]

Court of Requests, Affidavits, 6–9 James I (Miscellaneous Books, 127.)

[Cuthbert Burbage's Affidavit.]

Termino Trinit*atis* A° *Regni Regis* Jacobi Angliae ffr*anciae* et hib*erniae* octavo et Scotiae xliij° –/ *1610.*

xviij° die Junij A° etc 8° et 43°–/

Keysar Burbage Cuthbert Burbage of the p*a*rish of St Leonard*es* Shorditche in the countie of Midd*lesex* gent sworne sayeth that hee & the rest of the def^tes^ in this ho: Court at the sute of Rob*e*rt Keysar haue materiall witnesses to examine in the said cause, And that the said def^tes^ doe not nor have desyred any further tyme to examine their said witnesses for any wilfull delay to the said cause, And

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further that such witnesses as they nowe intend to examine are theise whose names followe that is to say John Marston of Barford in the county of wiltes clerk, Henry Evans of the Blackfryers in London gent. [illegible] his wief nowe [illegible] in London, Nathaniel Field, John Underwood, William Ostler, and William Baxstead of London gent. Phillip Rosseter of the Blackfryers London gent. & margaret Hawkins of London widowe—

10–18?

It is unfortunate that the depositions of the nine persons mentioned in [illegible] Burbage's affidavit as material witnesses are wanting. If these depositions existed, they would throw valuable light on the history of the Blackfriars, with which most of the persons named had been intimately associated for ten to [illegible] years, since the opening of that theatre in 1597.

[illegible]

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